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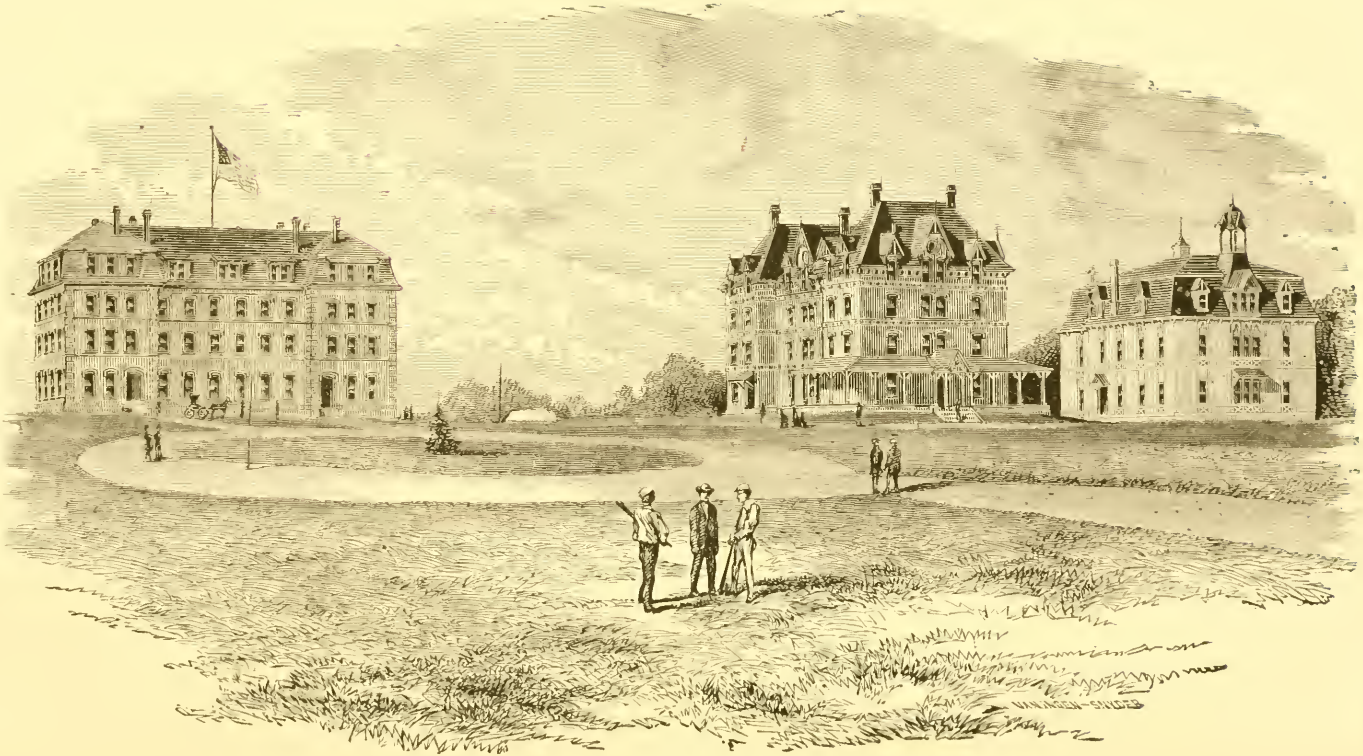
VAN INGEN-SNYDER

MASSACHUSETTS AGRICULTURAL COLLEGE.

EIGHTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

Massachusetts Board of Agriculture,

WITH AN APPENDIX

CONTAINING

REPORTS OF DELEGATES APPOINTED TO VISIT
THE COUNTY EXHIBITIONS,

AND ALSO

RETURNS OF THE FINANCES OF THE AGRICULTURAL SOCIETIES

FOR

1870.

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1871.

STATE BOARD OF AGRICULTURE.

1871.

MEMBERS EX OFFICIIS.

His Excellency WILLIAM CLAFLIN.
His Honor JOSEPH TUCKER.
Hon. OLIVER WARNER, *Secretary of the Commonwealth.*
WILLIAM S. CLARK, *Pres. Mass. Agricultural College.*

APPOINTED BY THE GOVERNOR AND COUNCIL.

	Term Expires
JAMES F. C. HYDE, *of Newton,*	1872
LOUIS AGASSIZ, *of Cambridge,*	1873
MARSHALL P. WILDER, *of Boston,*	1874

CHOSEN BY THE COUNTY SOCIETIES.

Massachusetts,	LEVERETT SALTONSTALL, of Newton,	1874
Essex,	GEORGE B. LORING, of Salem,	1872
Middlesex,	JOHN B. MOORE, of Concord,	1873
Middlesex North,	JONATHAN LADD, of Lowell,	1874
Middlesex South,	JOHN JOHNSON, of Framingham,	1872
Worcester,	THOMAS W. WARD, of Shrewsbury,	1872
Worcester West,	JOHN T. ELLSWORTH, of Barre,	1872
Worcester North,	LEWIS H. BRADFORD, of Fitchburg,	1872
Worcester North-West,	FARWELL F. FAY, of Athol,	1874
Worcester South,	NEWTON S. HUBBARD, of Brimfield,	1874
Worcester South-East,	WILLIAM KNOWLTON, of Upton,	1873
Hampshire, Franklin and Hampden,	A. PERRY PECK, of Northampton,	1873
Hampshire,	LEVI STOCKBRIDGE, of Amherst,	1874
Highland,	GEORGE T. PLUNKETT, of Hinsdale,	1872
Hampden,	WILLIAM BIRNIE, of Springfield,	1873
Hampden East,	HIRAM CONVERSE, of Palmer,	1873
Union,	E. W. BOISE, of Blandford,	1874
Franklin,	THOMAS L. ALLIS, of Conway,	1874
Berkshire,	ANDREW J. BUCKLIN, of South Adams,	1873
Hoosac Valley,	NAHUM P. BROWN, of Florida,	1873
Housatonic,	RICHARD GOODMAN, of Lenox,	1873
Norfolk,	ELIPHALET STONE, of Dedham,	1874
Hingham,	ALBERT FEARING, of Hingham,	1873
Bristol,	AVERY P. SLADE, of Somerset,	1872
Bristol Central,	NATHAN DURFEE, of Fall River,	1873
Plymouth,	CHARLES G. DAVIS, of Plymouth,	1872
Marshfield,	GEORGE M. BAKER, of Marshfield,	1873
Barnstable,	S. B. PHINNEY, of Barnstable,	1874
Nantucket,	ANDREW M. MYRICK, of Nantucket,	1872
Martha's Vineyard,	HERMAN VINCENT, of Chilmark,	1874

CHARLES L. FLINT, *Secretary.*

EIGHTEENTH ANNUAL REPORT

OF THE

SECRETARY

OF THE

BOARD OF AGRICULTURE.

To the Senate and House of Representatives of the Commonwealth of Massachusetts.

The past year has been one of the most remarkable for its meteorological characteristics within the memory of men. The winter was ushered in with a temperature almost as mild as May. No snow covered the ground for weeks, while several varieties of wild-flowers were gathered in the open air in many parts of the North. It was practicable to plough the ground till the very last of January, with the violets growing in sheltered nooks, and the weather eight degrees warmer through the month than it had been known for nearly fifty years. In some parts of New England the willows blossomed as early as the 5th of February, the *pyrus Japonica* in our gardens was ready to open its scarlet flowers at the same time, while, after the middle of the month, potatoes were dug in this State uninjured by the frost. The little snow that fell in March soon vanished, and April was like May. It had been a winter of rare mildness, followed by a spring earlier than had been known for many years, with the exception, perhaps, of that of 1865, a spring succeeding a season of severe drought.

The genial weather of spring, with all the conditions favorable to farm labor and to rapid growth of vegetation, led to high expectations of a fruitful and prosperous harvest. It was a warm May, a hot June, a scorching July, a broiling August. No rain fell for many weeks to lay the dust. A drought began with the summer solstice, increasing in severity very rarely, if ever, equalled in the whole history of New England. Farmers suffered for want of water, and the cattle panted from thirst.

The crop, of course, felt the effects of the drought. The grass in the pastures dried up, and the mowing stubbles were burned by the sun. Indian corn, among the best of cultivated plants to test the qualities of the season, actually died out on many an acre, and the root-crops ceased to grow on ordinary upland soils and many of them died about the middle of summer, the rains arriving so late in September that they failed to revive them in season to enable them to make much growth, though such of them as survived the dry weather unharmed made a wonderful progress later in the season.

When plants lie steadily dormant for many weeks of dry weather, they seem to preserve a greater degree of vitality till a period favorable to their growth arrives, than if they are subjected to occasional fluctuations by the occurrence of more or less showers, lifting them, for a time, partially out of their dormant state. In other words, a persistent dormancy, even if long continued, appears to be more favorable to the preservation of a good degree of vitality than a dormancy interrupted by repeated revivals of growth.

Still, most farm products suffered severely from the peculiarities of the season, though fruits of most kinds were abundant, ripening earlier than usual, and decaying more readily, on account, perhaps, of maturing so early.

Notwithstanding these characteristics, it was a year of general healthfulness among the people, and among farm stock. No fatal epidemics prevailed to decimate our herds. Towards the close of the year, however, the foot and mouth disease was introduced by cattle brought from beyond our limits, and spread with great rapidity. The action taken by the authorities, designed to check its progress, will appear in the following

REPORT OF THE CATTLE COMMISSIONERS.

The Commissioners on Contagious Diseases among Cattle, report, that nearly the whole of the year since our last report was made, has been one of thrift to our cattle-growing interest and its products. Until within a few weeks our herds have not been visited by any general malady, though at different times our attention has been called to herds which it was feared were afflicted with contagious disease. In April we were notified that a herd in Holden, Worcester County, was undoubtedly sick with contagious pleuro-pneumonia. Dr. Martin, of Worcester, made an examination of the case, and reported his opinion that it was a case of simple pneumonia and not contagious; and the animals recovering without any dissemination of the malady, proved the correctness of the opinion. So terrible and costly were the ravages of contagious pneumonia in former years, that many cattle-owners are extremely sensitive on that point, and often fear great danger where none exists.

Ordinary pneumonia, not uncommon at some seasons of the year, yields readily to treatment, is entirely different from the contagious type, and need cause no alarm. In our last report mention was made of a very fatal and apparently new disease in this State, which had carried off numbers of cattle in Great Barrington and Egremont, in Berkshire County. That disease did not entirely abate during the cold weather of last winter, but it was of a milder type, and there were no fatal cases. On the coming of warm weather, it again broke out in a more virulent form, and a fatal case occurred in May. The disease continued in that locality through the warm season, or until about the first of December, affecting not only cattle, but horses, sheep and swine, many of which have died. This disease, though localized to the towns of Barrington, North Egremont and Alford, and not found in other parts of the State, has been a great scourge, and inflicted losses on some farmers that are well-nigh ruinous. In some cases they have lost nearly their entire stock of domestic animals, and if they have the ability, they fear to risk the experiment of replenishing it. Examinations made this season have convinced us that the disease is one which is common in the fens of Scotland, in some of the swampy, malarious districts of our Southern States, and known by the technical name of Charbon. The sick animal has a very high fever, the blood is disintegrated and broken up, the liver becomes congested, the spleen very much enlarged, and the mucous membrane of the intestines diseased. It usually runs its course, and the animal dies in from one to four days. Sometimes it appears in boils on cattle, and can be easily communicated to man by contact with spots bare of skin, and breaks out in a pimple, which spreads, and in the end is nearly incurable. Its type varies a little in animals of different species, and sometimes in animals of the same species. In swine it may appear as carbuncular sore throat, or in that form of disease known as "hog cholera." In horses it appears in purple spots on the mucous membrane and with inflamed sore throat, and there is a discharge of bloody matter from some of the natural openings of the animal. The disease, in its virulent type, is highly contagious, and the poison is retained a long time in the carcass of the dead animal, and can be communicated. Great care should therefore be taken to bury the dead animals deeply and securely, that they may not be exhumed by dogs, and the virus scattered to renew its baneful work. Although there are no indications that this disease will spread extensively to other parts of the State, yet so great have been the losses of the farmers in the towns named, so great their apprehension of future disaster if they should stock their deserted farms, that we entertain the opinion that we should be justified in making a thorough examination of that locality to find, and if possible remove, the prime, exciting cause of the malady.

Late in November a cattle disease made its appearance here, which is entirely new to this State, and it is quite recent on the American continent. It has developed its characteristics sufficiently to prove that, although it is of a milder type, yet it is epizoötic aphtha, or the foot and mouth disease which has caused so much trouble and loss in England and adjacent countries. It undoubtedly came to the United States from England by way of Canada, being brought to the great distributing stock markets of Albany, Brighton and Cambridge by Canada cattle transported over the northern and western railroads. The disease is an eruptive fever, and so highly contagious that it is communicated from animal to animal by contact, by inanimate objects, and by driving healthy animals on the roads or yarding them in inclosures which have been trodden by the diseased. The contagious character of the disease, and the very short time it requires for incubation, caused its wide dissemination through the counties of Worcester, Middlesex, Essex, Norfolk, Bristol, Hampshire and perhaps others, before the Commissioners or the people were aware of its nature and consequences, or hardly of its existence. It broke out almost simultaneously in a score of places, and though the governor, on receiving information of its existence, promptly appointed Dr. E. F. Thayer to the vacancy then existing on the Commission, which was promptly called together, yet the investigations which were absolutely necessary to ascertain the origin and nature of the disease, and the manner in which it was being spread through the community, necessarily consumed some days, and delayed that prompt action for its arrest and eradication which was desirable.

It was ascertained beyond a doubt that Brighton was the focus of the disease, the point from which it took its departure for the yards and herds of the eastern part of the State. It was found that perfectly healthy animals driven through the yards of Brighton to their places of destination on distant farms developed the disease in periods varying from two to five days, and communicated it at once to all the cattle with which they came in contact. We learned that the disease as developed here was not fatal, that its great damage was in the loss of flesh and milk, the trouble and expense attending the doctoring of the sick and the injurious effect which might result, if milk, butter or beef from the contaminated animals should find its way to our markets; that it was extremely difficult to kill the virus or eradicate it from the buildings or grounds contaminated by it, and that it was very liable to break out afresh and with all its malignity at any time in the future. In view of all these facts the Commissioners deemed it their duty to interdict the driving of all working cattle, cows and store cattle to and from Brighton, Cambridge and Medford; allowing only such healthy cattle to be handled there as are intended for immediate slaughter. If it is found that this last class of cattle convey the disease to the towns where they are driven to supply the local beef markets, we shall forbid their passage, and those markets must be supplied for a short time with dressed beef obtained from Brighton or the West. At the same time a circular was sent to the mayor and aldermen and selectmen of all the cities and towns of the Commonwealth, advising them to strictly enforce section 5 of the Acts of 1860, chapter 219, by forbidding the driving of all cattle to or from their municipalities, or from place to place within their limits. The people were urged to coöperate with their authorities by giving information and assisting to enforce the law. We have urged the officers to be vigilant in the discharge of their duties, and particularly to direct the radical purification of all places that have been contaminated by the contagion, by the free use of the strongest and most effectual disinfectants. As a coöperative measure, the cattle grounds and yards of Brighton must be thoroughly purified. The virus of the disease was undoubtedly trodden into the soil there during the mild weather of early December, and though now dormant in the frozen earth, is yet alive, and will be roused to activity when the grounds are softened by thaws or the return of spring. We are of the opinion that the necessities of the case will fully justify us in making the outlay requisite to carry away the surface of those grounds to as great a depth as the poison has been trodden, and eradicate it by the use of sufficient quantities of carbolic acid and chloride of lime. Facts have come to the knowledge of the Commissioners which lead us to the confident belief that the virulence of this disease can be mitigated, and the disease itself stayed, by the application of diluted carbolic acid to the feet of all the animals in a herd which has been contaminated, whether the disease has become developed or not, and its application at the same time as a disinfectant to the floors and mangers of the buildings in which they are kept.

Your Commissioners would express the hope that the measures now in operation will prove effectual to not only check but eradicate this scourge and prevent its obtaining a permanent location in our midst, by which result it would entail enormous losses upon our stock owners, disarrange and injure our markets, fill the community with fear and distrust, and possibly injuriously affect the sanitary condition of our people. This hope may, however, be disappointed. The disease is new with us, and nobody here has had experience in attempts for its eradication. The losses it has brought upon some of the countries of Europe would indicate that it would be a wise policy, a true economy, to employ more stringent measures, and to make large present expenditures, if necessary, that this disease, like the contagious pleuro-pneumonia, may be at once and forever "stamped out." This, by rightly directed measure, can undoubtedly be done without resorting to the extreme remedy of slaughtering the infected herds. That we may be enabled effectually to discharge the duties which the law imposes upon us, to at once arrest and eradicate this new enemy to our great stock interest, an appropriation by the legislature seems to be necessary, and at the earliest possible day. Should the progress of the disease be such as to require any further legal enactments or the modification of those under which we are now acting, to assist us in our work, or should its development make it necessary for the intelligent action of the legislature or the good of the people, the Commissioners will present a supplementary report.

LEVI STOCKBRIDGE,
E. F. THAYER,
H. W. JORDAN,
Commissioners on Contagious Diseases among Cattle.

BOSTON, January 10, 1871.

PUBLIC MEETING OF THE BOARD,

AT FRAMINGHAM.

The usual country meeting of the State Board of Agriculture was held at the Town Hall, in Framingham, on Tuesday, Wednesday, and Thursday, Dec. 13th, 14th, and 15th.

The Board was called to order at 12 o'clock, on Tuesday, by Hon. MARSHALL P. WILDER, Chairman of the Committee on Meetings, who, after remarks of welcome by Hon. C. C. ESTY, on the part of the citizens of the town, and by GEORGE W. BROWN, in behalf of the Middlesex South Agricultural Society, addressed the meeting as follows: —

MR. WILDER'S ADDRESS.

Gentlemen of the Massachusetts Board of Agriculture: In the performance of the duty enjoined on me as Chairman of the Committee of Arrangements, I solicit your attention to a few remarks by way of commencing the business of this session.

Through the kindness of a merciful Providence, I stand before you to-day as the senior member of the Massachusetts Board of Agriculture, and as the only one of this assembly who was present at the time of its primary organization. In view of this fact, and that this present year will close the twentieth of its operations, I have thought it might be not only interesting but profitable to refer to its origin, history, and the work it has already accomplished.

The preliminary efforts for the establishment of the State Board of Agriculture emanated from a meeting of the Trustees of the Norfolk Agricultural Society, held January 28th, 1851. It was there voted, that "the president and secretaries be a committee to mature and adopt a plan for a convention of delegates from the various agricultural societies of the Commonwealth, to be holden at some convenient time and place, the object of which shall be to concert measures for their mutual advantage, and for the promotion of the cause of agricultural education."

This convention assembled at the State House, in Boston, on the 20th of March, 1851. The attendance was large, being composed of delegates, with officers and trustees of societies, and other friends of agriculture.

The session lasted for several days. After a thorough discussion of the subject, and a free interchange of opinion, a Central Board of Agriculture was formed. It was organized Sept. 2, 1851, by the choice of MARSHALL P. WILDER as President, HENRY W. CUSHMAN and JOHN W. LINCOLN, Vice-Presidents, ALLEN W. DODGE, Corresponding Secretary, and EDGAR K. WHITAKER, Recording Secretary, with three delegates from each incorporated society receiving the bounty of the Commonwealth, and in this form it exercised its functions, holding its meetings at the State House, for two years, when it finally culminated in the establishment in a department of the government, with the Secretary resident at the capital. The Act of the legislature was passed in 1852, and the present Secretary entered upon the duties of his office in February, 1853. By this Act, the governor of the State was a member of the Board, and each incorporated society receiving the bounty of the State was entitled to send a delegate, the term of whose office was to continue for three years. To these were added three other delegates, to be appointed by the governor and council, and also, as *ex* *officio*, the Lieut. Governor, Secretary of State, and now the President of the Massachusetts Agricultural College.

The first and most important business of the department was to secure the services of a permanent Secretary. All eyes were turned to Rev. Dr. Hitchcock, President of Amherst College, who had been intimately associated with the efforts for the promotion of agricultural education, and he was unanimously elected to that office, but his duties in connection with the college, and declining health, compelled him to decline the appointment.

The selection of Secretary then became a matter of deep solicitude, but after much deliberation and investigation of the various qualifications of various candidates, the choice fell upon CHARLES L. FLINT, then a young lawyer just established in business in New York, a gentleman whose love for rural pursuits induced him to abandon a lucrative profession and devote his life to the instincts of his nature. Fortunate indeed for the Board was the selection of a gentleman whose attainments and long experience have made his name extensively known, not only in our own but other lands. Long may he live to enjoy the meed of praise he has so richly deserved.

Thus the Board of Agriculture, with vested powers, became the organ of the farming community, being placed near and connected with the government, so that the whole legislation in reference to bounties, premiums, and general agricultural interest of the State has been controlled or influenced by the department, and thus by its operations it was also brought immediately into friendly communication and reciprocal relations with the various local agricultural associations of the Commonwealth, dispensing to them and receiving in return valuable information for the benefit of the public.

One of the first acts of the Central Board was the arranging of days for the various exhibitions of societies, and also the assignment to committees of special subjects for essays, both of which measures were retained by our present Board, and to which was immediately added the appointment of delegates to visit and report on the exhibitions of the local Societies.

By the Act constituting the State Board all the duties which had been performed by the Secretary of State in regard to agricultural matters now devolved on the Secretary of the Board of Agriculture. Thus a new and independent system of operations was established, whereby the Secretary became the chief officer and organ of the Board, on whom has devolved ever since the duty of digesting the returns of the societies and of preparing the annual volume of the department.

This annual volume embraces a most complete and perfect system of reports, containing abstracts of the various statements and experience of the best cultivators from all parts of the Commonwealth. It also contains the essays and reports of the Secretary, and the reports of special committees on special subjects. These volumes, embracing a period of twenty years, constitute a storehouse of information, in fact a comprehensive library, embracing almost every subject in agriculture, and they are eagerly sought after throughout the Commonwealth and country. When the Board was established, scarcely three thousand copies of the Report were required to supply the demand, and, in fact, less than two thousand copies had been previously called for; now, ten thousand copies are found to be insufficient to meet applications. The circulation of these Reports created also a wide-spread interest in other States, in regard to the organization and operations of the Board and the general agricultural system of the State. In fact, the Boards of Agriculture in the New England and other States are generally founded and modelled on that of Massachusetts, and to this very day the Secretary has applications from the executives of the newer States for our code of operations, and we believe that the great increase in the circulation of agricultural papers and documents may have arisen, in part, from the labors of the Board in creating a greater spirit of inquiry and enterprise in regard to agricultural matters.

The Massachusetts Board has always been composed of a body of earnest, intelligent, progressive men,—men who have given their time, their services, and best thoughts without compensation or hope of reward, except such as may come from the consciousness of duty well performed and of benefits conferred for the public good, and it may, without fear of reproach, ask to be judged by its proceedings.

The wide-spread interest in the breeding of pure stock is a striking instance; and, while contributing largely to this, it has at the same time greatly promoted and facilitated the diffusion of such stock, by constituting, as it were, through its Secretary at headquarters, a medium of intelligence, where inquiries could be made as to the choicest animals of all the different breeds, and of whom they could be obtained. Such inquiries were of almost daily occurrence, so that those seeking improved stock were easily put in communication with those who had it for sale. As an example of the effect of this enterprise on the part of the farmer, it may be stated that at the time of the organization of this Board there were but seventy-five pure-bred Jersey cattle in the State, whereas now many a town, and even some individual breeders, have a larger number than that, and the same is true, in a good degree, with regard to other choice breeds of stock.

Few are aware of the salutary influence which the Massachusetts Board of Agriculture has exercised on the farming community and the public mind during the period of its existence. An entire and complete change has taken place in public opinion with regard to the paramount importance of agricultural education. There are some here who remember, at the time of the organization of the Board, the great prejudice which existed against what was then termed "book farming," and there were but few papers or periodicals that would boldly stand forth as champions in the cause. But amidst all the discouragements, here was cherished and sustained the first general efforts for the establishment of an Agricultural College, now so favorably known and appreciated, and here ever since it has been fostered and encouraged as one of the most important branches of education receiving the patronage of the government.

And here let me say, if we would have our sons attain to great success as farmers, we must educate them; you must teach them how to apply science to practice. If you would have labor honored and respected, you must educate it. Therefore I rejoice in the prosperity of this college. The farmers hold the destinies of this nation in their hands. They are the conservators of the public good, the almoners of Heaven's bounty to the reduplicating millions who are to follow us; therefore, I say, educate labor, elevate it, honor it, dignify it, and in its turn it will elevate, enrich and dignify the State.

Nor must we forget the action of the State Board in regard to the extirpation of that terrible disease, the pleuro-pneumonia.

Nothing but the prompt and persistent action of the Board enabled the State to arrest and stop that fatal scourge. The aggregate cost to the State was less than seventy thousand dollars, but had it not been for the united and persistent action of the Board it probably would, here as in Europe, have devastated not only our own but other States, at a loss of hundreds of thousands, if not millions, of dollars. And who that is cognizant of these facts can doubt their far-sighted policy, and that this action of the Board with reference to that disease was worth more to the State and the country than many times the cost of our department from the beginning, or the expenses of running it for fifty years to come? Facts fully substantiate these statements, but what was of far more serious consideration is the fact that the use of these diseased animals and their dairy products was daily sapping the foundations of human life.

If any one thinks these statements exaggerated, let him reflect on the fact, that the loss of cattle in Great Britain from pleuro-pneumonia was estimated at one time at ten millions of dollars annually, resulting principally from a want of knowledge and vigilance in arresting it at its commencement, as was done in Massachusetts. All subsequent information justifies what has been stated in regard to this matter, when much less was known than at the present time.*

Here also, by a resolution, was instituted the primary proceedings which convened the National Convention of Farmers at Washington in 1851, and which resulted in the formation of the United States Agricultural Society, an association which for ten years, and until the late civil conflict, exercised a most happy influence, not only on the cause of agriculture, but in the promotion of friendly intercourse between the leading cultivators of the several States.

Here, too, in the councils of this Board, originated the proposal for establishing the New England Agricultural Society, now so successfully exercising its functions throughout New England, under the lead of one of our own members as President from the day of its formation to the present time.

The discussion of subjects of general utility not strictly agricultural have frequently attracted the action of the Board, as in the matter of public roads, which forms the topic of the lecture of to-day. Embracing the suggestions made by Gov. Claflin in his message to the legislature, on the subject of Public Roads, the Board instituted committees and offered premiums for the best essays, believing the subject to be one, not only of great importance for the comfort and well-being of the community generally, but as bearing directly on the interest and economy of the farmer's calling. Much of this interest, now so general, is justly due to the prompt action of this Board in creating, through its members and discussions, a sentiment which we believe will ere long revolutionize public opinion on the subject.

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* See Mr. Flint's Letter to Gov. Andrew, in the Report of 1863, p. 14–25, and in the Reports, '59, '60, '61, '62.

But while we rejoice in the prosperity of this Board, we would also recognize the many facilities which have so essentially aided its progress and usefulness. Among these may be named the coöperation of the Massachusetts Society for the Promotion of Agriculture, by the importation and distribution of pure-bred cattle, horses, and agricultural seeds,—a society which has always been represented in our councils from the first. Nor can we omit the influence of the Massachusetts Horticultural Society, the second institution of the kind organized on this continent, but second to none in the power it has wielded in the promotion of American Pomology, and from whence has emanated, more than from any other source, the great interest in fruit culture which has now spread throughout our whole land.

The Board early recognized fruit culture as an important branch of Massachusetts agriculture, and from the commencement it has enrolled in its ranks gentlemen of large experience, not only from this society but from the National Pomological Society, and it may safely claim in the department of fruits, both as it regards the nomenclature, recommendations, and improvement, a rank not surpassed by any other State. These statements are substantiated by the consideration that the cultivation of fruit in this State, if not now the second or third in statistical valuation, is destined soon to rival in importance the grain or vegetable crops of the State.

If there are any who doubt the usefulness and importance of this Board, let them examine the reports of the Secretary for the last twenty years, embodying, as they do, in addition to his own essays, the results of the mature deliberations of the best farmers and horticulturists from the various sections of the

State, and they will find more valuable information than in almost any other work. Almost an entire revolution has taken place in the received principles and practices of cultivation during the existence of the Board, and much of this can be traced to the investigations of its members and the publication of their experience, thus not only teaching each other, but making the knowledge of one the property of all.

The Massachusetts Board of Agriculture is now a permanent department of the State government, receiving the confidence and favor of the people. It has established a uniform system of operations in the local societies. Its office is continually open to the people of this State and the Union and other lands, and its Secretary is in correspondence with similar associations both at home and abroad, and thus is able to keep up with the progress of improvement, receiving information and distributing the results of his investigations and the deliberations of the Board.

Gentlemen, we live in an age of remarkable activity, of startling enterprise, of noble achievement,—an age which has developed the most stupendous results in the march of civilization and all the arts of life. Discoveries, inventions, and improvements in the great industrial pursuits we seek to promote, bear witness to the same progressive march. Never before has the cultivator of the soil had such advantages for the acquisition of knowledge, and never before have the energies of mankind been so profoundly moved and actively engaged in efforts to relieve toil, reward labor, and multiply the blessings and comforts of life. How remarkable the improvements which characterize the arts of husbandry! Compare the old wooden plough of our boyhood with the modern iron plough, suited to all soils and situations, or, if you please, with the gigantic steam plough, moving across the broad prairie like a thing of life, turning up its numerous furrows at once, and leaving behind a wake like that of a majestic ship. Compare the old scythe and sickle of our fathers, tediously gathering up their crops, with our wonderful mowing and reaping machines, cutting down their ten to twenty acres per day,—aye, or go with me to the vast grain-fields of the great West, look down that broad valley, see those two hundred reaping machines, followed by a thousand men, women and children, binding up the golden sheaves at the rate of two hundred acres per hour. Look at the improved methods of cultivation,—the novel processes of reproduction by the art of hybridization,—the accession of new and improved grains, vegetables, and fruits everywhere springing up around us,—the increased taste for choice fruits, extending through every grade of society, —the large and general circulation of agricultural newspapers, periodicals and books, and the universal desire to obtain everything which promises to be interesting, useful or profitable,—and last, not least, the establishment of agricultural colleges, schools and societies throughout our States. Look at these and compare them with the past, and who will say that we do not live in an age of progress and improvement?

CONCLUSION.

Gentlemen, I have cordially coöperated with the Board in its inception, organization and operations. I have ever felt a lively interest in its welfare and usefulness, and I have therefore thought it expedient to lay before you the foregoing facts. This I have done without any intention or desire to magnify the importance of the department, but for the purpose of preserving its history, and rendering justice to those worthy men who assisted in laying its foundations, and also to those who have labored with us for its advancement. Many of the progenitors of the Board have fallen by the way, but others have risen up to fill their places. Among those who have ceased from their labors, we recall the names of Edward Hitchcock, Seth Sprague, Moses Newell, Benjamin V. French, John W. Lincoln, John Brooks, William Parkhurst, Richard S. Fay, Johnson Gardner, J. H. W. Page, and others who took a less prominent part in the early history of its proceedings. We would also remember the decease of one of our fellow-associates the present year, Mr. James Thompson, the delegate of the Nantucket Agricultural Society for a long course of years, a gentleman of sterling ability, of stirring enterprise, and real love of agricultural life. But while we cherish a recollection of these worthy men, and would strew their graves with fragrant memories, we would not forget the services of many others now living, who have labored zealously for the advancement of our common cause and the prosperity of the Board. If any think we have spoken too favorably of the Board, or that it has not accomplished all that was anticipated, let them compare the condition of agriculture in our State at the time of its organization with the subsequent improvement, and the well-defined and systematic knowledge of the present day.

This review of our first twenty years of work I think may be considered as satisfactory, for it shows clearly that our plan of operations is a good one. Much time has necessarily been expended in learning how to work, but I think we are on the right track, and may confidently hope to arrive at results, in the future as in the past, which will not only advance our common cause, promote the public weal, but redound to the honor of the Commonwealth.

AFTERNOON SESSION.

The Board assembled at 2 o'clock, P. M., Col. Wilder in the chair, the first business in order, according to the programme, being the following lecture upon

ROADS AND ROAD MAKING.

By Charles L. Flint.

Mr. President and Gentlemen:—The Committee on Meetings have desired me to prepare a paper upon Roads, suggesting at the same time that it be short and designed to open a discussion of the subject. It can hardly be expected, of course, that I should attempt to go much into the details of the construction and the management of road repairs. They would involve the necessity of a treatise more or less elaborate, which would weary your patience and cut off a more general expression of opinion on your part, especially important at the present time with a view to leading to some legislation, which is greatly needed to change the present system; a system which has long since outgrown its usefulness and notoriously fails to accomplish the ends for which it was created.

And, indeed, the necessity for this minuteness of treatment seems to have been superseded by the publication of the essays prepared in answer to the offer of prizes by this Board at its last country meeting at Pittsfield, and awarded by an able and efficient committee; essays which have been widely circulated, and accomplished a most important work by arousing the attention of the community to the importance of some improvement in the deplorable condition of our common roads.

And here allow me to testify to the admirable manner in which that committee attended to its duty. At the time the awards were made, I had read but two or three of the thirty essays submitted for their decision, and that only at their request, and for a special purpose, with reference to one of the prizes to be awarded. More recently, within three or four weeks, I have read them all with critical care, and am free to say that my judgment fully confirms the conclusions to which the committee arrived, and the impartial justice of the awards which were made. No com mittee could have been more faithful or competent to discharge the delicate duty assigned to it.

And here let me commend to the public not a mere casual perusal, but the careful study of those essays, printed both in a form by themselves and inserted at the end of the last report of the Board, so as to be easily accessible to every one who desires to inform himself of the main principles which underlie the most important art of road making.

It would be easy to show the importance of this subject by referring to the intimate connection which exists between the value of land, the general prosperity of the community, and the condition of its roads. Every farmer, every owner of real estate, has a vital interest in the perfection of the roads which lead to it, and especially the roads which lead from it to the natural market. And this interest is a pecuniary one, not based on considerations of comfort merely, but coming home to the pocket in the shape of the wear and tear of teams and vehicles, and the amount of draught required to move a load, always dependent, to a very large extent, on the character and condition of the surface of the road, and in the enhanced value of a farm lying on a thoroughly good highway. So true is this, that it is no exaggeration to say that there can be no better test of the progress of civilization in a community than the condition of its roads. This close connection of the prosperity of the people and the perfection of the means of communication between one community and another, is so well understood in Europe that good roads may be said to be the rule there, and poor ones the exception—just the reverse of what we see everywhere in this country. Nor do I think it too much to say that the poorest road I saw in Switzerland, Germany and France is better than the best of our own.

But perhaps it would give a broader view of the vast pecuniary importance of the subject to refer to a few statistics which have just come into my hands, in accordance with a resolve of the last legislature, requiring me to obtain replies from all the towns in this Commonwealth to the following questions, directed to the selectmen of towns, and the mayor and aldermen of cities:

First.—What is the number of miles of public highway within the limits of your city or town?

Second.—What has been the amount expended by your city or town for the repairs of highways? Average for the last five years and exclusive of amount paid for breaking out roads in winter?

Third.—What is the number of surveyors of highways in your city or town?

Fourth.—What the kind of material used in covering and repairing roads?

Fifth.—What number and kind of bridges are supported wholly or in part by the city or town?

Sixth.—Are the road taxes paid in money or labor?

Seventh.—How much has the city or town paid during the last five years for damages or legal defence in consequence of alleged defects in the roads?

BARNSTABLE COUNTY.

Cities and Towns.	Miles of Road.	Amount Expended.	No. of Surveyors	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years
Barnstable,	162	$4,020 00	3	Turf and loam,	Fifteen wooden and stone,	Money,	$25 00
Brewster,	30	600 00	6	Sand and clay,	Two wooden,	Money,†	55 00
Chatham,	35	1,450 00	12	Loam and shells,	Two wooden,	Labor,	57 50
Dennis,	95	2,782 18	3	Loam and clay,	Ten wooden, 8 supported by the town, 2 partially.	Money,	478 41
Eastham,	27 1-2	255 19	6	Loam and gravel,	One, part wood and earth,	Money,	7 25
Falmouth,	70	1,050 00	3	Loam and gravel,	Eight stone,	Money,	35 00
Harwich,*	81	1,000 00	3	Clay and loam,	Twelve wooden, 6 stone,	Money,	15 00
Mashpee,	33 1-2	300 00	3	Sand and loam,	Six stone,	Money,	None.
Orleans,	28	800 00	1	Clay and loam,	One wooden,	Money,	$11 00
Provincetown,	8	2,068 88	3	Gravel and clay,	One wooden, one-half supported by the town,	Money,	Nothing.
Sandwich,	85	2,708 33	19	Clay loam,	Three wooden,	Money,	$162 19
Truro,	15	465 00	3	Loam and clay,	Four sand, 1 wooden bridge,	Money,	Nothing.
Wellfleet,	28	1,000 00	17	Clay,	Seven wooden,	Money,	$1,116 00
Yarmouth,	55	2,000 00	13	Clay, loam and gravel,	Twenty-five wooden and stone,	Money,	15 00

BERKSHIRE COUNTY.

Cities and Towns.	Miles of Road.	Amount Expended.	No. of Surveyors	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years
Adams,	200	$5,000 00	3	Gravel,	Three iron, 4 wooden truss, 14 wooden lattice,	Money,	$1,450 00
Alford,	24	400 00	8	Material by roadside,	Four wooden,	Labor,	13 33

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* In addition, Harwich has been adjudged to pay about $1,000 on two bridges between the towns of Yarmouth and Dennis.

† In 1870 in labor.

BERKSHIRE COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Becket,	90	$2,500 00	3	Gravel and dirt,	Forty-two wooden and stone,	Money,	$175 00
Cheshire,	50	2,600 00	14	Gravel and cinders,	Four stone, 15 wooden bridges, 25 small sluices,	Both,	125 00
Clarksburg,	15	900 00	5	Common soil on roads,	Four wooden bridges,	Labor,	50 00
Dalton,	28	1,140 00	None.*	Gravel and loam,	Nine large wooden bridges,	Money,	144 25
Egremont,	Unk'n.	770 00	9	Gravelly loam,	Fifteen,	Money,	Nothing.
Florida,	30	940 00	14	Soil or gravel,	One covered bridge, 125 feet long, in part supported, 1 open bridge and 15 small bridges.	Labor,	$225 00
Great Barrington,	66	3,349 41	3	Soil, gravel and cinders,	One iron, 14 wooden with stone abutments, 3 wooden with log abutments.	Money,	363 18
Hancock,	32	1,000 00	16	Stone and dirt,	Nineteen plank, 5 stone bridges,	Labor,	50 00
Hinsdale,	42 2-5	1,780 00	14	Common earth and gravel,	Twenty-two wooden bridges,	Both,	25 00
Lanesborough,	50	1,000 00	14	- -	Sixteen ten-feet span and over, 40 smaller ones, all covered with wood or stone.	Labor,	257 09
Lee,	50	2,710 21	3	Gravel and common earth,	Thirty-two wooden,	Money,	272 00
Lenox,	53 7-40	1,934 32	3	Gravel, cinders in part,	Three over 75 feet in length, 16 smaller bridges,	Labor and money,	87 10
Monterey,	45	1,055 00	9	Dirt and gravel,	Ten wooden, 15 stone and logs covered with dirt.	Labor,	8 00
Mt. Washington,	17	400 00	5	Earth,	Wooden,	Labor,	Nothing.
New Ashford,	11	300 00	9	Gravel,	Twenty wooden,	Labor,	Nothing.
N. Marlborough,	112	1,500 00	1	Stone and earth,	Forty-three,	Money,	$60 00
Otis,	55	1,920 00	17	Earth,	Four wooden bridges,	Labor,	142 00
Peru,	46	960 00	15	Earth from the roadsides,	Ten or 12 small wooden bridges,	Money 1-3, labor 2-3,	50 00
Pittsfield,	125	4,181 03	15	Common gravel,	Fifty, 5 iron Whipple arch, 5 common iron, the others wooden and stone.	Money,	472 00
Richmond,	50	850 00	5	Material from roadside,	About 20 bridges, covered mostly with plank,	Labor,	40 02

Sandisfield,	–	$1,540 00	24	Dirt and gravel,	Twenty wooden,	Money,	Nothing.
Savoy,	57 7-8	2,000 00	16	Dirt,	Fifty wooden and stone,	Labor,	$20 00
Sheffield,	105	3,010 80	19	Gravel and dirt,	Thirty wooden, 2 covered,	Labor,	Nothing.
Stockbridge,	50	2,000 00	3	Gravel principally,	Two wooden, 1 iron and a number of small bridges.	Money,	Nothing.
Tyringham,	23	925 00	0	The best loam and gravel that can be obtained by the roadside.	Ten wooden,	Labor,	$25 00
Washington,	45	2,504 75	12	Gravel, brush and dirt,	Fifty-one exclusive of sluices, all the larger ones are wood lattice and truss.	Labor and money,	604 44
West Stockbridge,	38 1-5	1,200 00	8	Gravel, cinders, &c.,	Sixteen wooden and stone,	Both,	300 00
Williamstown,	60	2,000 00	15	Mostly gravel,	Three stone, 4 Howe, 8 truss, 45 stringer and brace bridges.	Labor,	700 00
Windsor,	80	1,300 00	25	Earth from the roadsides,	Twenty bridges from 10 to 70 feet long, stone and wood.	Labor,	370 00

BRISTOL COUNTY.

Acushnet,	26	$800 00	2	Gravel,	Three wooden, 8 stone,	Money,	$3 00
Attleborough,	110	2,700 00	28	Gravel,	Twenty-seven wooden, 15 stone,	Money,	288 85
Berkley,	40	1,200 00	0	Fine gravel and hard pan,	None,	Labor,	Nothing.
Dartmouth,	112	2,000 00	35	Loam and gravel,	Forty-eight, 5 covered with wood,	Money 1-3, labor 2-3,	$1,220 00
Dighton,	50	3,500 00	16	Sand to gravel,	Eight stone, 5 plank bridges,	Labor,	10 00
Easton,	67	2,665 00	11	Gravel,	Twenty-four stone bridges, 5 plank bridges,	Labor,	Nothing.
Fairhaven,	30	1,898 25	5	Gravel and stone,	Two wooden and stone, New Bedford and Fairhaven bridge.	Money,	Nothing.
Fall River,	–	50,000 00†	1	Gravel and loam and granite chips.	Two stone, 3 wooden,	Money,	$100 00
Freetown,	65	1,300 00	‡	Gravel and marl,	Thirteen stone, 3 wooden bridges,	Money,	Nothing.
Mansfield,	47	1,700 00	10	Gravel,	Thirteen wooden bridges,	Money,	Nothing.

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* Work done by Selectmen.

† In 1870.

‡ Selectmen.

BRISTOL COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
New Bedford, .	87	$32,852 76	7*	Paving-stones, macadamizing and gravel.	One wooden, ...	Money, . . .	$375 00
Norton, . . .	63 1-8	2,280 00	8	Gravel and loam, . .	Twenty-eight covered with stone over small streams, 18 covered with plank over larger streams.	Money 3-4, labor 1-4, .	Nothing.
Raynham, . .	54 1-2	2,000 00	12	Cinder and gravel, . .	Six, 5 of stone covered with wood, 1 covered with stone.	Money, . . .	$15 00
Rehoboth, . .	100	2,500 00	21	Gravel, loam and sand, .	Fifteen stone, 10 plank bridges, ...	Money, . . .	60 00
Seekonk, . .	51	1,700 00	14	Gravel and loam, . .	Twelve stone, 1 plank, ...	$1,400 in labor, $600 in money.	Nothing.
Somerset, . .	21	1,560 00	7	Gravel, dirt from roadsides, cinders, oyster shells.	Wooden; one-half one and one-third another in Swansea.	Labor, ...	Nothing.
Swanzey, . .	52	2,689 00	16	Gravel and loam, . .	Six stone, 4 wooden, ...	Labor, ...	Nothing.
Taunton, . .	275	22,098 96	1†	Gravel and crushed stones,	One iron drawbridge, 3 stone arch, 22 planking,	Money, . . .	$361 00
Westport, . .	70	1,820 00	36	Loam and gravel, . .	Twelve stone bridges, ...	$1,200 in labor, $620 in money.	70 00

DUKES COUNTY.

Chilmark, . .	20	$500 00	7	Loam and gravel, . .	One stone abutment 16 feet, wooden, . .	Labor, ...	$20 00
Edgartown, . .	25	920 00	1	Sand, clay and gravel, .	None, ...	Both, ...	75 00
Gay Head, . .	–	–	–	No public highway, . .	– – – –	– – –	–
Gosnold, . .	–	–	–	No public highway, . .	– – – –	– – –	–
Tisbury, . . .	50	600 00	1	Sand and loam, . . .	Seven wooden, 10 stone, ...	Money, . . .	Nothing.

ESSEX COUNTY.

Amesbury, . .	43	$2,286 48	16	Gravel, ...	Two; Essex Merrimac and Rock's bridges, and a large number of small stone bridges.	Money, . . .	$110 00
Andover, . .	110	2,500 00	28	Gravel and sand, . . .	Five wooden, 1 stone, ...	Money, . . .	339 97
Beverly, . . .	100	6,000 00	1	Coarse gravel, . . .	Portion of the pile bridge between Beverly and Salem, and 200 feet over Bass River and some stone culverts.	Money, . . .	Nothing.
Boxford, . .	75	1,000 00	19	Gravel and soil, . . .	Eight plank, 9 stone, and many small ones, .	Labor, ...	$50 00
Bradford, . .	30	1,270 00	7	Gravel, ...	One wooden, ...	Money, . . .	Nothing.
Danvers, . .	38 1-4	2,400 00	13	Poor gravel, ...	Four wooden, 5 ballast-bed, 1 stone bridge, .	Money, . . .	$175 00
Essex, . . .	19	900 00	6	Gravel, ...	Three, ...	Labor, ...	Nothing.
Georgetown, . .	32	800 00	12	Common gravel, . . .	None, ...	Money, . . .	$10 00
Gloucester, . .	80	6,125 00	6	Gravel, ...	One drawbridge, 2 or 3 culverts covered with plank, and 1 bridge with draw.	Money, . . .	128 00
Groveland, . .	30	1,000 00	14	Gravel, ...	None but small bridges, ...	Money, . . .	50 00
Hamilton, . .	30	640 00	8	Gravel, ...	Four stone, 2 plank bridges, ...	Labor, ...	Nothing.
Haverhill, . .	88 3-4	12,282 00	21	Gravel, ...	Numerous stone and wooden bridges over smaller streams, and 2 wooden bridges over Merrimac with stone piers and abutments.	Money, . . .	$995 00
Ipswich, . .	74	4,000 00	16	Gravel, ...	Two stone, 1 wooden, ...	Labor, ...	‡600 00
Lawrence, . .	85	15,000 00	1	Gravel, ...	Nine wooden, 4 stone bridges, ...	Money, . . .	1,800 00
Lynn, . . .	130	10,696 49	1	Gravel and broken stones,	Four: 1 pile bridge, 1 floating bridge, 1 1-2 plank, 1-2 bridge between Lynn and Saugus.	Money, . . .	2,290 92
Lynnfield, . .	20	700 00	5	Mostly gravel, . . .	One wooden and 1 stone bridge over Saugus River, supported jointly with Wakefield	Labor, ...	Nothing.
Manchester, . .	14 1-6	1,201 63	5	Gravel, ...	Twelve: 11 stone, 1 wooden, ...	Money and labor and teams from almshouse.	Nothing.
Marblehead, . .	20 1-2	5,000 00	5	Broken stones and gravel, .	None, ...	Money, . . .	$300 00
Methuen, . .	61 1-3	3,680 00	20	Gravel or loam, . . .	Seven stone arched, ...	Both, . . .	60 83

* Mayor and aldermen.

† Superintendent.

‡ Case not settled.

ESSEX COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Middleton,	31	$970 00	10	Gravel,	Nine wooden, 1 stone bridge,	Money,	$13 00
Nahant,	12	2,127 00	1	Gravel,	None,	Money,	300 00
Newbury,	Between 40 and 50	1,331 14	10	Gravel,	- - - -	Money,	Nothing.
Newburyport,	35	6,000 00	1	Gravel,	Suspension bridge across the Merrimac River, 3-4 of wooden bridge across the Merrimac River, 1 wooden bridge across the Artichoke River, 1-2 of wooden bridge across the Artichoke River.	Money,	$2,000 00
North Andover,	79	3,795 00	18	Gravel,	Five plank, from 10 to 15 feet wide, 9 stone bridges, 4 feet square, many smaller ones.	Labor,	*645 97
Peabody,	48	5,396 20	9	Gravel,	Sixteen stone, 7 wooden,	Money,	4,097 00
Rockport,	10 1-2	1,600 00	2	Gravel and granite chips,	No bridges except culverts,	Money,	10,000 00
Rowley,	33	1,000 75	13	Gravel,	One stone arched and 1-2 ditto with Newbury, 3 plank, 3 stone bridges and smaller ones, also 1-2 of a plank bridge with Newbury.	Labor,	Nothing.
Salem,	35	20,500 00	1	Gravel and macadamizing,	Six wooden,	Money,	$2,800 00
Salisbury,	35	2,000 00	11	Poor gravel,	Thirteen: 5 stone arch, remainder wood. Five span the Powow River, 2 the Merrimac; 7 are wholly supported by Salisbury, 5 by Salisbury and Amesbury, and 1 by Salisbury and Newburyport.	Both,	2 00
Saugus,	40	1,942 25	5	Gravel,	Four plank, 2 covered bridges covered with mud and gravel.	Money,	394 66
Swampscott,	10	2,000 00	1	Gravel,	One: a bridge over a railroad,	Money,	300 00
Topsfield,	50	1,200 00	9	Gravel,	Four wooden, 1 stone, over Ipswich River; 10 wooden, 9 stone, over large brooks; 100 over small streams and culverts, 1-3 of them wood.	Labor,	1,000 00
Wenham,	16 1-4	544 50	8	Gravel,	Thirteen over small streams, 12 of which are stone and 1 of wood.	Money,	40 00
West Newbury,	48	1,602 41	15	Gravel,	Seventeen wooden, 159 stone bridges,	Both,	32 75

FRANKLIN COUNTY.

Ashfield,	95	$1,500 00	30	Earth,	Eighty wooden and stone,	Labor,	$14,000 00
Bernardston,	30	520 00	12	Gravel,	Three open trestle, 80 feet in length, 7 of same, 30 feet long.	Labor,	Nothing.
Buckland,	50	4,000 00	10	Common soil,	Nineteen wooden, 1 iron,	Labor,	$7,000 00
Charlemont,	47	1,000 00	20	Common soil and gravel,	Eleven wooden, 4 covered, the rest open,	Labor,	1,813 00
Colrain,	100	2,500 00	41	Native soil,	Eighteen wooden, from 60 to 120 feet in length,	Labor,	Unknown.
Conway,	70	1,860 00	3	Earth,	Eighteen wooden, from 30 to 100 feet long, 6 of them covered.	Money,	$137 00
Deerfield,	78 1-5	3,500 00	5	Loam and gravel,	Three wooden: 2 of them 400 feet long, 1 90 feet; also 8 smaller ones.	Both,	500 00
Erving,	23	1,400·00	7	Common earth,	Four wooden bridges, one-half supported by Erving.	Labor,	100 00
Gill,	35	700 00	11	Best in vicinity,	Eight wooden bridges,	Both,	580 00
Greenfield,	48 1-2	4,796 66	10	Earth, gravel and stone,	Seven wooden truss, 7 stringer wooden,	Money,	200 00
Hawley,	54 1-2	2,000 00	10	Brush, stone, gravel and earth.	Twenty wooden, with stone abutments,	Labor,	25 00
Heath,	50	1,000 00	22	Gravel,	Ten wooden, average 20 feet,	Labor,	300 00
Leverett,	43	950 00	17	Material from roadside,	Seventeen wooden bridges, 4 or 5 stone bridges,	Labor,	100 00
Leyden,	38	1,500 00	14	Stone and common earth,	Two bridges with stone abutments and framed, 12 with stringers and plank, 100 small bridges or culverts.	Labor,	1,000 00
Monroe,	35	500 00	10	Dirt, stone and plank,	Ten abutment, trussle and log bridges,	Labor principally,	Nothing.
Montague,	73 1-5	2,649 04	3	Sand, gravel and clay,	One stone, 4 covered wood, 22 open,	Money,	$230 00
New Salem,	75	2,500 00	24	Loam and gravel,	Twenty-one wood, 1 stone,	Labor,	101 38
Northfield,	65	2,500 00	14	Earth by the roadside,	Quite a number of small wooden bridges over small brooks only.	Labor,	1,200 00
Orange,	80 1-2	2,602 00	†	Best in the vicinity,	Two stone, 4 arches each, 200 feet long; 22 of six feet span or more, wooden bridges with stone abutments.	– – –	900 34

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* Case not settled.

† Selectmen.

FRANKLIN COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Rowe,	32	$1,200 00	14	Mostly soil, but little gravel,	Six stone, 12 stone and wood,	Mostly labor and materials.	$62 00
Shelburne,	55	3,578 71	23	Loam and gravel,	One iron and 2 large wooden bridges, and 6 or 8 smaller wooden ones.	Both,	182 00
Shutesbury,	54	1,775 00	19	Gravel,	Eighteen wooden and stone,	Labor,	35 00
Sunderland,	35	600 00	3*	Loam for light land, sand for heavy.	No large bridges; wood formerly used; new ones built of stone.	Money,	Nothing.
Warwick,	80	1,200 00	12	Gravel,	Twenty-five stone, 25 wooden bridges,	Labor,	Nothing.
Wendell,	60	2,000 00	23	Loam and gravel,	One stone, 35 wooden,	Labor,	$175 00
Whately,	46	1,320 00	15	Gravel principally,	Eleven stone and 12 common plank bridges,	Labor,	197 00

HAMPDEN COUNTY.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Agawam,	49	$1,700 00	3	Sand, gravel, marl and stone.	Three wooden, over the Agawam River, supported jointly by Agawam and W. Springfield.	Money,	$88 00
Blandford,	90	2,500 00	40	Loam, soil and dirt,	Fifty wooden, and many sluices of wood and stone.	Money,	Nothing.
Brimfield,	70	2,025 93	8	Loam, gravel, sand, &c.,	One-half of 5 river bridges, 2 iron and 3 wooden, and 30 wooden bridges.	Money,	$537 83
Chester,	47 1-2	2,507 00	22	Loam and gravel, mostly loam.	Nine, averaging 100 feet long, ten, 40 to 50 feet long, ten, 25 feet, all wooden, and many smaller bridges.	$2,000 in money, balance in labor.	190 00
Chicopee,	75	4,000 00	3	Gravel and soil,	Two enclosed wooden, 1 iron over railroad track.	Money,	400 00
Granville,	75	2,202 00	20	Loam and gravel,	Fifty wooden bridges,	Money,	2 00
Holland,	40	340 00	4	Mostly gravel,	Plank,	Labor,	Nothing.
Holyoke,	70	3,061 70	*	Hard pan and gravel,	Two National Bridge Company's iron bridges, 4 wooden bridges.	Money,	$400 00
Longmeadow,	40	1,800 00	4	Sand and red loam,	No large bridges, small stone ones,	Money,	100 00

Ludlow,	55	$1,000 00	10	Loam and gravel,	Four across Chicopee River, 3 wooden, 1 iron, other bridges across brooks are of wood and stone, 12, from 8 to 10 feet, across other smaller ones.	Labor,	Nothing.
Monson,	120	3,000 00	15	Gravel, clay and loam,	Five in part, 2 iron 3 wooden, and 3 stone arched, 1 iron, 7 large wooden bridges and quite a number of small bridges, wooden and stone, 8 to 12 feet span.	Money,	$100 00
Montgomery,	31	790 00	10	Gravel,	Eleven wooden with stone abutments,	Labor,	Nothing.
Palmer,	115	3,000 00	12	Loam and gravel,	Five iron in part, 7 wooden in part, 2 iron wholly, 12 wooden wholly.	Money,	$531 33
Russell,	26	1,000 00	1	Earth,	Nine wooden,	Money,	100 00
Southwick,	80	1,080 00	9	Natural soil,	29 open wooden, 1 stone culvert,	Labor,	35 00
Springfield,	60	10,822 00	-	Gravel and McAdam,	Three wooden, 2 iron,	Money,	4,930 00
Tolland,	40	800 00	Not any.	Gravel and dirt,	Ten timber and plank,	Money,	Nothing.
Wales,	35	493 33	5	Loam and gravel,	Ten or twelve small bridges, all wooden,	Labor,	$15 00
Westfield,	108	4,936 00	24	Principally gravel,	Thirty-nine wooden, 1 iron,	Money,	2,422 00
West Springfield,	46	2,065 07	6	Gravel,	One-half of 3 bridges, wooden, 2 of them covered, 1 open.	Money,	197 50
Wilbraham,	-	-	-	-	-	-	-

HAMPSHIRE COUNTY.

Amherst,	60	$2,649 39	4	Loam and gravel,	Twenty-five with stone abutments and plank covering, and between 200 and 300 culverts, mostly with stone piers and covering.	Money,	$628 30
Belchertown,	125	3,100 00	None.	Gravel and loam,	Forty, all wooden,	Money,	1,700 00
Chesterfield,	57	1,230 00	10	Gravel mostly,	Fifteen wooden,	Money,	Nothing.
Cummington,	55	1,500 00	23	Gravel and loam,	Eight over Westfield River, 6 over other streams,	Labor,	$50 00
Easthampton,	40	2,800 00	3	Red rock and coal ashes,	Twenty wooden, 2 of them covered,	Money,	650 00

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* Selectmen.

HAMPSHIRE COUNTY—CONTINUED.

CITIES AND TOWNS	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Enfield, . . .	22	$1,586 08	13	Loam, gravel and sand, .	Ten wooden bridges, ...	Either, . . .	$1,881 00
Goshen, . . .	35	1,210 00	15	Loam and gravel, . .	Six stone, 7 wooden, ...	Labor, ...	50 00
Granby, . . .	60	630 00	8	Ordinary soil, . . .	Sixty plank, from 2 to 30 feet long, . . .	Labor, ...	Nothing.
Greenwich, . .	35	800 00	8	Gravel and loam, . .	Seven wooden and several small ones of stone and wood.	Labor, ...	$187 00
Hadley, . . .	60	1,500 00	12	Loam and gravel, . .	Six wooden, ...	Money, . . .	324 50
Hatfield, . .	40	2,400 00	3	Loam, some clay, sand and gravel.	Twenty-five wooden, 7 stone culverts, . .	Money, . . .	800 00
Huntington, .	48	922 99	21	Gravel and dirt, . . .	Twelve: 1 iron, 2 stone, others wooden, . .	Money, . . .	423 74
Middlefield, . .	44	1,000 00	12	Dirt, ...	Thirty wooden, ...	Money, . . .	207 00
Northampton, .	120	6,761 00	1	Gravel, ...	Twenty wooden, 4 iron, ...	Money, . . .	1,430 00
Pelham, . . .	48	1,800 00	19	Gravel and natural soil, .	Eight with stone abutments, covered with plank.	Labor, ...	60 00
Plainfield, . .	50	1,200 00	22	Gravel or earth, . . .	Ten small, stone abutments, covered with plank.	Labor, ...	07 50
Prescott, . .	43	1,700 00	16	Earth, ...	Fifteen, ...	Labor, ...	Nothing.
South Hadley, .	33 3-4	1,940 00	2	Sand upon clay roads, gravel and clay upon sandy.	Three stone, 1 iron, 6 wooden, ...	Money, . . .	Nothing.
Southampton, .	70	2,000 00	15	Ordinary turnpiking, . .	Thirteen wooden, ...	Both, ...	Nothing.
Ware, . . .	250	2,700 00	9	Gravel, ...	Stone and wooden, ...	Mouey, . . .	$1,400 00
Westhampton, .	46	1,200 00	12	Every variety the town affords.	Fifty wooden and stone, ...	Both, ...	190 00
Williamsburg, .	40	2,000 00	3	Generally gravel, . .	Five iron, 10 wooden, ...	Money, . . .	200 00
Worthington, .	71	1,300 00	12	Loam from sides of highway,	Twenty-five wooden, from 15 to 60 ft. in length,	Both, ...	Nothing.

MIDDLESEX COUNTY.

Acton,	35	$1,992 83	18	Gravel, loam and sand,	Sixteen stone, from 10 to 25 feet span, 3 longer wooden bridges, from 30 to 75 feet span.	Money,	$25 00
Arlington,	20	6,000 00	3	Gravel and crushed stone,	Seven wooden and 2 stone,	Money,	100 00
Ashby,	80	1,500 00	3	Gravel,	Forty: about 1-2 plank, the others stone,	Labor,	Nothing.
Ashland,	33	1,300 00	3	Gravel,	Fifteen wooden, 1 stone,	Money,	$107 00
Bedford,	30	1,200 60	1	Gravel and earth from the roadside.	Ten wooden,	Money,	37 50
Belmont,	20	3,250 00	3	Blue gravel,	None except culverts and small plank bridges over brooks, &c.	Money,	40 00
Billerica,	63	1,500 00	*	Gravel,	Six wooden,	Money,	106 98
Boxborough,	25	400 00	8	Gravel,	Twelve small stone bridges for water, 2 for cattle.	Money,	Nothing.
Brighton,	30	4,500 00	*	Gravel,	Five wooden drawbridges,	Money,	–
Burlington,	50	800 00	3	Gravel,	Seven wooden,	– – –	$5 00
Cambridge,	150	80,500 00	11†	Gravel and broken stone chiefly—some paving.	Nine of wood, 2 covered with earth and paved,	Money,	14,000 00
Carlisle,	40	650 00	7	Material by roadside,	Two covered with stone, 2 with wood and 1-2 the bridge across the Concord River with Bedford, wooden.	Money,	200 00
Charlestown,	20	46,990 50	10	Gravel and ledge-stone, cobble-stone paving.	Five pile bridges,	Money,	–
Chelmsford,	275	2,000 00	11	Gravel,	Twenty-four stone bridges,	Labor,	700 00
Concord,	70	4,000 00	3*	Gravel,	Ten wooden, 4 stone, 2 iron,	Money,	85 00
Dracut,	30	2,000 00	20	Gravel,	Five stone, 2 wooden,	Labor,	200 00
Dunstable,	34 1-2	400 00	9	Gravel and loam,	Twenty-two, principally of small size, built of stone, excepting 2 which are covered with wood.	Labor,	22 00
Everett,	26	4,000 00	5	Gravel,	Malden Bridge in part,	Money,	Nothing.
Framingham,	86 1-2	2,919 12	23	Gravel,	One iron, 4 stone, 10 wooden,	Money,	Nothing.
Groton,	100	1,500 00	16	Gravel,	Five wooden over river,	Money,	$800 00

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* Selectmen.

† Mayor and Aldermen.

MIDDLESEX COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Holliston, . .	60	$1,650 00	3	Gravel and such other material as can be obtained.	Twelve stone, 5 stone with plank covering, 30 culverts.	Money, . . .	$305 74
Hopkinton, . .	53	3,300 00	3	Gravel and crushed stone, .	None but small bridges, ...	Money, . . .	427 00
Hudson, . . .	36	4,400 00	9	Gravel, ...	Six wooden, 1 stone with 3 arches, . . .	Money, . . .	Nothing.
Lexington, . .	60	2,800 00	3	Principally blue gravel, .	None, ...	Money, . . .	Nothing.
Lincoln, . .	44	1,206 48	10	Gravel, ...	Seven-eighths of a wooden bridge over Concord River, and a small wooden bridge near Rhoades' mill, and stone culverts.	Money, . . .	$175 00
Littleton, . .	38 1-2	1,096 00	13	Gravel, loam and sand, .	One small wooden bridge, a number of others covered with flat or split stones, mostly culverts.	Money, . . .	320 00
Lowell, . . .	98	34,564 35	3	Broken stone covered with gravel.	Three stone and 12 wooden, ...	Money, . . .	6,447 57
Malden, . . .	25	5,000 00	1	Gravel, ...	Five wooden, ...	Money, . . .	Nothing.
Marlborough, .	100	4,000 00	2	Gravel, ...	No bridges of any account, ...	Money, . . .	$250 00
Medford, . .	40	7,120 00	3	Stone and gravel, . .	One railroad bridge, wooden, 4 river bridges, wooden.	Money, . . .	94 00
Melrose, . .	28	1,994 09	3	Sand and gravel, . . .	Malden Bridge in part, ...	Money, . . .	Nothing.
Natick, . . .	58	2,440 00	1	Gravel and broken stone, .	One stone over Charles River, ...	Money, . . .	$2,276 24
Newton, . .	84	11,509 00	7*	Gravel; since last March broken stone in part.	Six wooden and 4 stone, ...	Money, . . .	311 00
North Reading, .	25	800 00	11	Gravel, ...	Ten wooden, 4 stone, ...	Labor, ...	850 00
Pepperell, . .	90	1,253 00	19	Coarse gravel and flaky slate.	Three over Nashua River, one 225 feet long, one 175 feet long, one 140 feet long, granite and wooden; also, 3 over Nissitissit River, each of wood, open, 50, 55, 60 feet long.	Labor, ...	1,250 00
Reading, . .	58	2,140 00	3	Partly "sugar-gravel" (so called), and gravel from the roadsides.	One wooden, in part, ...	Money, . . .	75 00

Sherborn,	45	$1,100 00	14	Gravel,	Two wooden, over Charles River, and one-half of each supported by town.	Money,	$3 00
Shirley,	44	500 00	3	Gravel,	One covered wooden, 10 open wooden,	Money,	50 00
Somerville,	45 3-10	20,000 00	*	Argillaceous blue stone, coarse at bottom, fine on top, covered with gravel.	One wooden, one-half built of wood, and one-half bridge arched with granite.	Money,	3,766 48
Stoneham,	22	1,700 00	2	Gravel,	Assists in supporting Malden Bridge; and has numerous culverts.	Money,	789 64
Stow,	60	1,000 00	16	Gravel,	Fourteen stone and 4 wooden,	Money,	50 00
Sudbury,	72	1,560 00	11	Gravel,	One and one-half stone arched bridges, 1 1-2 pile bridges, 1-2 of 2 stone abutment bridges, with wooden stringers and plank, 9 large brook bridges, with stone abutments and stringers.	Labor, $2,000; money, $400.	25 00
Tewksbury,	70	1,600 00	7	Gravel,	Four wooden bridges,	Money,	Nothing.
Townsend,	100	2,500 00	12	Sand, gravel, loam,	One hundred and fifty of all kinds,	Both, $500,	$500 00
Tyngsborough,	30	7,200 00	7	Gravel,	None,	Both,	1,032 45
Wakefield,	32 1-4	3,000 00	5	Gravel,	Five stone, 2 wooden, all quite small; also pays towards the support of Malden Bridge.	Money,	117 00
Waltham,	70	7,000 00	1	Broken stone on principal streets; on others, gravel.	Two arched granite, 2 pile wooden, of from 200 to 400 feet each, and several small bridges and culverts, mostly stone.	Money,	Nothing.
Watertown,	23	10,000 00	4	Crushed stone and gravel,	Two drawbridges, 3 without draw, wooden exposed, 1 bridge, wooden, covered with earth.	Money,	Nothing.
Wayland,	42	985 00	9	Gravel,	Two stone, 4 wooden,	Money,	$1,500 00
Westford,	47	1,500 00	18	Material by roadside,	Ten stone bridges,	Money,	75 00
Weston,	30	2,124 00	6	Gravel,	Two wooden, over Charles River, jointly with Newton, 1 wooden, over Stony Brook, jointly with Waltham.	Money,	5 00
Wilmington,	40	1,000 00	13	Gravel,	Twelve stone and 3 covered with wood,	Labor,	500 00
Winchester,	25	4,000 00	6	Gravel,	Wooden,	Money,	325 00
Woburn,	100	5,000 00	†	Gravel,	Twelve wooden,	Money,	4,000 00

* Selectmen.

† Selectmen are surveyors.

NANTUCKET COUNTY.

Cities and Towns.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Nantucket,	*	$300 00	1	Clay, sand and coal ashes,	About 20 built of timbers and plank,	Money,	Nothing.

NORFOLK COUNTY.

Cities and Towns.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Bellingham,	54 1-2	$1,200 00	19	Gravel, loam and sand,	Thirteen and one-half wooden and 9 stone bridges	Labor,	Nothing.
Braintree,	45	2,310 00	1	Gravel,	Ten stone, 4 wooden bridges,	Money,	$2,454 00
Brookline,	30 1-5	9,185 36	5*	Broken stone and gravel,	Half wooden bridge over the railroad on Longwood Avenue, and one-half wooden bridge across Charles River, between Brookline and Cambridgeport.	Money,	Nothing.
Canton,	40	2,200 00	3	Common gravel,	Seven and one-half wooden and 4 stone bridges,	Money,	$117 00
Cohasset,	19	4,307 41	3	Gravel,	One wooden, in part, Hingham and Quincy bridges.	Money,	60 00
Dedham,	100	8,500 00	20	Gravel and stone, with some concrete for walks, &c.	Four stone and 8 wooden bridges,	Money,	35 00
Dover,	35	950 00	8	Generally gravel,	One-half of 5 bridges over Charles River, 3 wooden, 2 stone, and 8 over brooks, 7 stone, 1 wood.	Chiefly labor,	2,500 00
Foxborough,	51 1-2	173 60	5	Gravel, when easy of access,	Three covered with plank, others with gravel—all small.	Money,	Nothing.
Franklin,	80	2,269 28	9	Gravel and loam,	Five stone arch, 2 wooden,	Money,	$110 00
Hyde Park,	22	2,700 00	3	Gravel,	Two wooden pile bridges, 2 Mosely iron,	Money,	Nothing.
Medfield,	32	1,200 00	6	Gravel,	Nine wooden, 1 stone,	Money,	Nothing.
Medway,	85	1,685 82	3	Gravel,	Eleven stone and 10 wooden, wholly by town, 3 stone and 2 iron, in part by town.	Money,	Nothing.
Milton,	42	5,073 31	3	Gravel,	Half of wooden bridge, with iron, half of four bridges over the Neponset River, 1 wooden, 2 stone, 1 iron, 8 smaller ones.	Money,	$125 00
Needham	75	6,684 00	4	Wood, stone and gravel,	Six wooden, 4 stone, supported in part,	Money,	50 00

Norfolk,	40	$1,200 00	4	Gravel and slate stone,	One-half of an iron bridge over Charles River, 4 stone arched and 3 wooden bridges.	Money,	Nothing.
Quincy,	50	5,634 76	3	Gravel and stone chips,	Three wooden bridges,	Money,	$227 25
Randolph,	45 1-4	2,750 00	8	Gravel,	None,	Money,	50 00
Sharon,	60	1,540 00	20	Gravel, loam and sand,	Twenty-nine and one-half,	Money,	12 00
Stoughton,	56 3-4	3,208 00	10	Gravel,	Stone, all small,	Money,	339 00
Walpole,	52	1,720 50	3	Gravel,	Ten wooden, 9 stone, (small,)	Money,	58 00
West Roxbury,	75	20,000 00	5	Crushed stone and gravel,	None,	Money,	2,000 00
Weymouth,	70	6,429 00	5	Gravel,	Two long wooden bridges over Weymouth Fore and Back Rivers, 1 wooden over O. C. & N. R. R. and 10 stone bridges, 4 to 5 feet wide.	Money,	2,325 36
Wrentham,	100	2,300 00	5	Gravel principally,	Eight or ten of all kinds, none large or expensive.	Money,	Nothing.

PLYMOUTH COUNTY.

Abington,	78 2-5	$4,691 59	24	Gravel,	Twenty-seven stone, 1 covered with wood,	Money,	$4,000 00
Bridgewater,	67 1-4	2,753 97	14	Gravel, sand and loam,	Fourteen large bridges over Taunton and Town Rivers, 5 stone, 7 stone with one sluice covered with wood, 1 wooden bridge, 1 iron and 12 small bridges over streams.	Money,	715 94
Carver,	77	1,160,00	15	Gravel, loam and sand,	Nine stone, 3 wooden, 10 or more culverts,	Labor,	7 50
Duxbury,	65	2,004 87	12	Clay, chips, and natural soil,	Twenty-three, 19 have stone abutments and covers and four have stone abutments and plank covers.	Labor,	742 67
East Bridgewater,	53	3,411 00	19	Gravel and cinders,	Eleven stone, 9 wooden,	About half in labor, half in money,	245 16
Halifax,	40	460 00	1†	Sand or gravel on low ground, loam or clay on light soil.	Twenty-four that are 4 feet and upward in width; 7 of them are 18 or 20 feet in width,	Money,	53 00

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* Cannot tell. † Agent. ‡ Selectmen.

PLYMOUTH COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Hanover,	40	$2,073 00	10	Loam, sand and gravel,	Forty or more, all built of stone, except 5 which have stone abutments and are covered with plank.	Labor,	Nothing.
Hanson,	31	1,600 00	15	Gravel,	Sixty-six stone, eight wooden bridges,	Labor,	Nothing.
Hingham,	60	4,115 78	1	Gravel generally,	A part of pile bridges over Weymouth River and Fore River.	Money,	$5 00
Hull,	7	265 00	1	Clay and beach gravel,	4 wooden and stone,	Money,	Nothing.
Kingston,	28	1,472 00	9	Gravel, cinders and clay,	Two wooden, 2 stone abutments, covering of wood, 12 stone, 3 of these are about 18 feet span, others small, from 4 to 8 feet.	Money,	$110 00
Lakeville,	55	1,250 00	11	Gravel,	Twelve stone bridges,	Money,	Nothing.
Marion,	24	600 00	1	Sand and gravel,	Four wooden bridges,	Money,	Nothing.
Marshfield,	50	2,083 00	13	Gravel and soil from roadsides.	Thirteen wooden, supported wholly by the town, 2 drawbridges equally by Marshfield, and South Scituate and Scituate and Marshfield.	Money and labor,	Nothing.
Mattapoisett,	31	715 58	1	Usually good gravel,	Stone 11, most of them over small streams, of the 3 principal ones 2 are wooden, 1 stone arch	Money,	Nothing.
Middleborough,	142	6,400 00	45	Mostly gravel, little loam,	Seventeen river and 40 smaller bridges, 6 of the river are stone, 4 all wooden, and seven wooden and stone.	Half labor, half money.	–
N. Bridgewater,	67 2-5	4,400 00	*	Gravel,	Twenty-six of stone, one of wood; streams are small and some of the bridges are quite small.	Money,	$200 00
Pembroke,	58	1,200 00	13	Clay, gravel, chips, bark, cinders.	Twenty-eight stone, 4 of wood,	Labor,	44 00
Plymouth	85	4,400 00	12	Gravel, loam and cinders,	Fourteen, principally wooden,	Money,	50 00
Plympton,	29	1,100 00	14	Gravel,	Twenty-three, all but 2 of stone,	Labor,	100 00
Rochester,	50	800 00	11	Gravel and loam,	Twenty-two stone, 3 wooden bridges,	Money,	20 00

Scituate,	41	$2,981 49	17	Gravel,	One wooden 240 feet long, wholly supported, 1 wooden 240 feet long, one-half supported, 2 wooden over mill waste ways 10 feet long, 6 stone from 8 to 12 feet long.	Money one-third, labor two-thirds.	Nothing.
South Scituate,	40	2,000 00	22	Gravel,	One-half of Union bridge across North River, drawbridge.	Labor,	Nothing.
Wareham,	35	1,500 00	9	Loam, cinders,	Seven wooden, five stone,	Money,	Nothing.
W. Bridgewater,	55	1,500 00	7	Stony gravel, principally,	Nearly all stone, those recently built covered with wood.	Money,	$90 00

SUFFOLK COUNTY.

Boston,	195	$325,000 00	†	Stone and gravel,	Twelve wooden, 2 iron,	Money,	§$35,170 46
Chelsea,	27 1-4	17,000 00	‡	Gravel,	Chelsea Bridge part, North Chelsea part,	Money,	3,000 00
North Chelsea,	14	5,250 00	1	Gravel,	Four solid fill and pile,	Money,	Nothing.
Winthrop,	10	600 00	1	Mostly gravel,	None,	Money,	Nothing.

WORCESTER COUNTY.

Ashburnham,	100	$3,660 00	3	Gravel,	Twenty-seven stone and 25 wooden,	Money,	$435 00
Athol,	100	4,500 00	3	Loam and hardpan,	Twenty-nine wooden, 1 stone,	Money,	Nothing.
Auburn,	50	1,297 00	–	Common earth,	Seven wooden, 3 stone bridges,	Money,	$6 25
Barre,	103	6,400 00	38	Loam and gravel for repairing, gravel for covering.	Forty-eight wooden, no other except stone culvert.	Money,	969 00
Berlin,	35	1,200 00	10	Three-fourths of the roads with gravel, other ¼ soil.	Eleven bridges, 3 stone, 8 covered with plank,	Labor,	350 00
Blackstone,	46	2,500 00	8	Loam and gravel,	Three covered wooden, 5 stone arch, 5 open wooden, 1 iron bridge.	Money,	200 00
Bolton,	48	1,200 00	15	Earth and gravel,	No bridges of any considerable size, only stone arches or rude structures of joist and plank.	Money,	100 00
Boylston,	53	1,000 00	12	Gravel,	Three wooden across the Nashua River,	Labor,	40 00

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* Selectmen. † Mayor and Aldermen. ‡ Mayor and Aldermen; Superintendent. § City employs a city solicitor and two assistants who are paid regular salaries.

WORCESTER COUNTY—CONTINUED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how Paid.	Damages for 5 years.
Brookfield,	60	$1,200 00	13	Gravel,	Nineteen wooden, span from 15 to 110 feet, smaller bridges not counted.	Labor,	¶$500 00
Charlton,	150	2,800 00	15	Gravel and stone,	Two hundred stone and plank,	Labor,	75 00
Clinton,	18	2,621 67	1	Gravel,	One iron and 1 wooden,	Money,	120 00
Dana,	43	800 00	14	Gravel,	Sixteen wooden,	Labor,	61 00
Douglas,	63 1-2	3,000 00	29	Loam and gravel,	Fourteen wooden, 1 stone,	Labor,	310 00
Dudley,	80	1,340 00	3	Earth,	Six wooden, 2-2 wooden, ⅔ wooden, ½ stone arched bridge.	Money,	20 00
Fitchburg,	95 1-2	14,778 00	5*	Gravel except ⅜ of a mile; granite block paving.	Four iron, 4 stone arch, 4 wooden truss bridges, 14 wooden platform bridges,	Money,	755 57
Gardner,	56	3,200 00	6	Gravel,	There are no bridges except small ones over brooks, mostly covered with stone.	Money,	50 00
Grafton,	66	2,280 00	*	Mostly gravel,	Thirteen wooden, 13 stone,	Money,	150 00
Hardwick,	85	2,500 00	30	Sand and gravel,	Thirty-nine wooden and stone, 1 iron; 3 of them are ½ supported by New Braintree.	Money,	1,600 00
Harvard,	62	1,580 00	21	Gravel and loam,	Nine that cross small streams, 7 of them stone and 2 covered with plank, also ½ of a bridge, wooden, that crosses the Nashua River.	Labor,	165 75
Holden,	107	900 00	1†	Gravel,	Four stone, 9 wooden,	Money,	17 00
Hubbardston,	75	1,500 00	1	Gravel and sandy loam,	Twenty wooden bridges and 10 culverts,	Money,	2,000 00
Lancaster,	60	1,500 00	1	Sand gravel,	Three covered,—1 iron, built this year,—3 open bridges, with some 12 or 16 small bridges.	Money,	Nothing.
Leicester,	65	2,800 00	22	Generally loam, very little gravel accessible.	Twenty-two bridges besides small, flat stone bridges, about 3 or 4 stone arched, others planked.	Money,	Nothing.
Leominster,	80	1,898 78	3	Gravel,	Thirteen stone, 9 wooden,	Money,	$35 00
Lunenburg,	72	1,425 00	18	Gravel and loam,	Seven stone, 3 wooden,	Money,	Nothing
Mendon,	44	960 00	13	Loam, stone, hardpan, gravel.	Wooden and stone, all small,	Money,	$659 87

Milford, . .	75	$6,000 00	3*	Crushed stone in principal streets; loam and sandy gravel elsewhere; no good gravel being obtainable.	No bridges over 12 feet span, all covered with plank.	Money, . . .	Nothing.
Millbury,	44 1-8	1,951 53	16	Mostly gravel, . . .	Nineteen wooden, 1 small stone bridge, . .	Money, . . .	$75 00
New Braintree, .	50	1,220 00	18	Mostly gravel, . . .	Two wooden, 1 supported jointly with Hardwick, 60 feet span, and 8 small wooden.	Labor, ...	7 00
Northborough, .	38	1,210 70	3	Gravel, ...	Sixteen stone, 8 plank, ...	Money, . . .	150 00
Northbridge, . .	40	2,500 00	10	Gravel, loam, &c., . .	Fifteen wooden and 2 stone, ...	Both, ...	585 00
North Brookfield,	82	1,800 00	8	Stones and dirt, . . .	Twelve wooden, 22 stone, ...	Money, . . .	349 50
Oakham, .	‡	1,040 00	15	Gravel, ...	Unknown, ...	Labor, ...	Nothing.
Oxford, . . .	75	1,930 00	15	Gravel, ...	Two stone arch bridges, 16 wooden do., and stone culverts,	Money, . . .	154 00
Paxton, . . .	38	680 00	10	Gravel, ...	No bridges of any account, ...	Money, . . .	13 50
Petersham, . .	76	1,320 00	29	Gravelly loam, . . .	Four stone, 16 wooden, ...	Money, . . .	125 00
Phillipston, . .	42	942 94	18	Gravel when it can be had,	All stone; no large bridges, ...	Money, . . .	Nothing.
Princeton, . .	70	2,040 00	3	Earth from roadside, . .	Twenty-four bridges, ...	Money, . . .	Nothing.
Royalston, . .	75	1,499 14	26	Earth and stone, . . .	Nineteen that span over 20 feet; wooden, 2 that are housed.	Money, . . .	$2,271 50
Rutland, . .	72	2,100 00	25	Gravel or sand, according to location or convenience.	Fifteen wooden, 10 stone bridges, . . .	Labor, ...	350 00
Shrewsbury, . -	60	1,540 00	ǁ	Material from roadside, .	Eight covered with plank, ...	Money, . . .	Nothing.
Southborough, .	60	1,410 00	3	Gravel, ...	Seventeen, all stone, ...	Money, . . .	A trifle.
Southbridge, . .	§	2,140 00	3	Earth and gravel, . .	Two stone arch, 1 iron, 9 wooden, . . .	Money, . . .	$4,200 00
Spencer, . .	100	2,160 00	15	Gravel, ...	Nine, ...	Money, . . .	206 45
Sterling, . .	79	1,266 77	3*	Gravel if possible, . .	Eight, all small wooden bridges, . . .	Money, . . .	95 50
Sturbridge, . .	80	1,500 00	20	Material by roadside, . .	Six over Quinnebaug River; about 20 smaller ones, stone and wood,	Labor, ...	100 00

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* Selectmen. † Superintendent. ‡ Not known. § Cannot ascertain. ǁ One commissioner

¶ Four hundred dollars of this sum was paid in consequence of an accident to a party in passing around when the road was fenced up, the road being repaired; not from a defect in the road.

WORCESTER COUNTY—CONCLUDED.

CITIES AND TOWNS.	Miles of Road.	Amount Expended.	No. of Surveyors.	Material on Road.	Number of Bridges.	Road Taxes, how paid.	Damages for 5 years.
Sutton,	150	$2,000 00	27	Gravel when obtainable,	Fifty, wooden and stone,	Labor principally,	$100 00
Templeton,	80	2,200 00	*	Best gravel obtainable,	Four wooden wholly and 2 partially, and 3 stone and numerous small culverts.	Money,	230 00
Upton,	60	1,320 00	15	Gravel and roadside material.	Ten covered with plank, 1 arch bridge; large number of smaller ones covered with flat stones	Money,	324 50
Uxbridge,	80	230 00	15	Gravel,	Two stone arch bridges, 15 wooden, all river,	Labor,	600 00
Warren,	65	2,500 00	*	Gravel, loam and clay,	Two wooden, 2 stone and one iron,	Money,	Nothing.
Webster,	28 3-4	1,081 30	*	Mostly gravel,	One stone, 7 wooden bridges,	Money,	$300 00
Westborough,	80	-	-	Gravel,	Twenty, mostly wooden, besides 3 between towns, one-half supported by Westborough.	Money,	Nothing,
West Boylston,	34 2-5	4,002 00	11	Gravel and loam,	One stone, 6 wooden,	Both,	$3,000 00
West Brookfield,	75	1,400 00	10	Material on the highway,	Three wooden bridges wholly,	Labor,	Nothing.
Westminster,	100	1,200 00	25	Gravel, loam, etc.,	Twenty stone, 35 wooden bridges,	Labor,	$323 00
Winchendon,	125	2.800 00	1	Gravel, clay and loam,	Twenty-five wooden bridges,	Money,	5 00
Worcester,	150	18,000 00	1	Gravel, broken stone, cinders with a small amount of paving,	Twenty stone arch bridges, 12 wooden bridges, and a large number of stone culverts.	Money,	5,000 00

* Selectmen.

SUMMARY.

COUNTIES.	Number of miles of highway.	Average ann. am't expended on highways for five years.	Number of Surveyors.	Amount of damages for five years.
Barnstable, . . .	753	$20,499 58	95	$1,977 35
Berkshire, . . .	1,651	53,670 52	313	6,138 41
Bristol, ...	1,321	137,263 97	236	2,502 85
Dukes, ...	95	1,192 00	9	95 00
Essex, ...	1,604	130,490 85	318	28,535 10
Franklin, . . .	1,454	49,651 41	372	29,037 72
Hampden, . . .	1,272½	49,223 03	196	10,048 66
Hampshire, . . .	1,453	43,929 46	243	10,249 04
Middlesex, . . .	3,064	344,445 37	378	42,028 50
Nantucket, . . .	–	300 00	1	–
Norfolk, ...	549	44,782 26	63	5,011 61
Plymouth, . . .	1,309	54,937 28	297	6,383 27
Suffolk, ...	246¼	347,850 00	2*	38,170 46
Worcester, . . .	3,892	141,624 83	633	27,223 39
Totals, . . .	18,663¾	$1,419,860 66	3,156	$207,401 36

* In some cities and towns the number of Surveyors is not given, the reply to the question being, "Mayor and Aldermen," or "Selectmen."

It will appear from these returns that we have in this State about nineteen thousand miles of highway, for, including the few towns that returned the number of miles as not known, it would increase the aggregate to a greater extent than that. The aggregate length of all the railroads in this State is but 1,258 miles.

It is safe to say that the common roads, though the original cost, mile for mile, may have been much less, are vastly more important to the population of the State than the railroads. It would be difficult to do without railroads, to be sure, and no doubt put us to untold inconvenience, especially as we have become accustomed to their use, but it would be quite impossible to do without common roads. They are indispensable to a civilized community, and may be reckoned among the necessities of life.

The annual cost of keeping these roads in repair exceeds seventy dollars per mile, amounting in the aggregate to about a million and a half. If the roads were well built in the first place, no doubt the cost for repairs would be very much lessened.

The number of surveyors of highways exceeds three thousand, or an average of more than ten to a town. In the multitude of counsellors there may be wisdom, but the one-man power is the rule for action, and it will be found that the few towns that have adopted the system of having a superintendent or road-master a sufficient length of time to show what he can do, can point to better roads and more efficient and well executed work than those towns that have divided the responsibility to such an extent that it is too weak to stick anywhere. Responsibility is invariably lessened by division, and about in proportion to the number among whom it is distributed.

Surprising as it may seem when its utter inefficiency is so generally admitted, the system of working out taxes in labor, or the commutation system, is still continued in nearly one hundred towns in this State, eighty-six paying road taxes entirely in work, thirty-one partly in money and partly in labor. It is a curious fact that the towns that work out the taxes pay a larger amount for damages from defective and ill-cared-for roads than those that pay in money. Take for example the county of Franklin, where nearly all the road taxes are paid in labor, and we find the average damage per mile returned at about $20, while in Norfolk County, where nearly all the road taxes are paid in money, the average is only about $9.13 per mile,—less than half,—or, if we omit the town of Ashfield in Franklin County, where the damage was exceptionably large, we still have the average damage $11.50, or more than $2 *per mile* greater than Norfolk where the money tax prevails.

Two towns, Gay Head and Gosnold, have no public highways to speak of. The town having the least number of miles of highway is Hull, 7. The town having the largest number, is Chelmsford, 275.

In proceeding to treat upon the subject before me, I shall have but little to say in regard to the location of our roads, since, bad as they are in many cases, their line was long since determined, and new roads to be laid out will always bear a very small proportion to the old ones. It ought to be borne in mind hereafter, however, when any new road is proposed, that any reasonable amount of money spent in procuring surveys by the most competent engineers, will be the best investment that can be made, rather than to run the location by "guess-work," and perhaps eventually involve a vastly larger expense in building and grading than a well-considered location would have cost.

Our roads are neither laid out properly nor constructed as roads ought to be. The first settlers pushed off into the forest to seek new lands, and naturally built in elevated situations to avoid the miasms of swamps, and for the purposes of protection or greater safety. Their ways were foot-paths or bridle-paths cut through the woods, till they could clear up and make passable roads, and when a town finally grew up the roads were naturally made to accommodate its individual citizens. Of course it could not be expected that they would be laid out in accordance with any fixed principles, or with any reference to the wants of a more advanced civilization. The greatest good of the greatest number was sacrificed to individual interest, or the convenience or caprice of a single person. It is time now that we had something better. And let us not boast of our times till we have better means of communication.

It is a principle perfectly well established among engineers that roads should be so substantially constructed that the cost of maintenance shall be reduced to the minimum. The fundamental principles of formation and construction should be studied and understood by every road builder, and observed in all localities, though they may not admit of so complete application in a thinly settled district as in the vicinity of a city where the travel is greater and the means of construction more abundant.

One of these general principles is that the nearer the location of the road approximates to a straight and level line the better; but a straight line which does not at the same time admit of a level profile will often lose the advantage of being the shortest distance between two places. It did not occur to the projectors of our earlier roads and of our turnpikes, that the handle of a pail or a kettle is no longer when it lies at rest in a horizontal position than when held upright. They did not know that while a horse on a level is as strong as five men, on a steep hill he is not so strong as three; for three men with a hundred pounds each will ascend a hill faster than a horse with three hundred pounds. Straightness of line should always be sacrificed to obtain a level or to avoid a steep and heavy grade.

A road curving around a hill will often be no longer than a straight one over it, for this latter is called straight only because its curvature is less apparent to the eye, and compared with a horizontal plane it is decidedly crooked. And after all, the difference in length of a straight and slightly curved or winding road is small, for taking two places ten miles apart with a road curving so that you could nowhere see more than a quarter of a mile of it at once, and its length would exceed a perfectly straight road between the two places by only a hundred and fifty yards.

It has been laid down as a general rule that you may increase the length of a road to avoid a hill to twenty times the height that is to be saved by such increase; that is, to save a hill a hundred feet high, it is better to go two thousand feet around it, and even then you'll find "the longest way round the shortest way home." We see, therefore, that straightness, though very desirable when it can be had, is by no means the highest characteristic of a good road. It is far more important that it should be level, for unless we have a level surface, a large part of the strength of the team must be spent in raising the load up the hill, in addition to the friction to be overcome. To draw a load up an incline, the resistance of the force of gravity is as great an addition to the whole weight of the load as the height of the incline added to its length, so that an incline of one foot in twenty requires the team to lift up by main strength one-twentieth of the whole weight in addition to overcoming the friction caused by the entire load.

But leaving the location and the construction of new roads, as coming more properly within the province of the professional road engineer, I wish to call your attention to a few of the more striking and common mistakes in the mending and care of country roads, faults which seem to arise from a want of knowledge of the first principles of road-making on the part of those intrusted with the supervision of the highways.

And first, with regard to the shape of the road-bed. Over a gravelly and hilly country, and over a flat country with a stiff or clayey soil, no one would hesitate to say that the road-bed should be raised above the level of the sides, and crowned sufficiently to shed the water; but the error, astonishingly prevalent, and indicated, adopted and approved by the writers of a large proportion of the thirty essays alluded to, many of them practical surveyors of town highways, is to finish them in a convex curve forming an arc of a circle with the centre raised a foot and often eighteen inches or more, and the curvature at the sides so abrupt as to make it dangerous to turn out on meeting a carriage, and always giving the driver a feeling of insecurity. I do not refer to the elevation above the surrounding land, but simply to the shape of the road-bed, the elevation of the centre above the sides, or what might be called the "transverse profile" of the travelled part of the road itself.

To show that this is no uncommon occurrence I may mention that the county commissioners of one of our large counties, only two or three years ago, in making the specifications for a road only twenty feet wide, required that the road should "crown" in the centre no less than eighteen inches, or one and one-half in ten, and no amount of reasoning could lead them to reduce this enormous convexity. Is it not time for the law to step in and define what the transverse profile of a road ought to be for a given width?

Let us see the results of this serious error. The convexity is so great that the centre of the road is the only place where a carriage stands upright. The travel, therefore, clings to the middle of the road, wearing one path for the horse and two ruts for the wheels, wearing the road down very unevenly.

The water, therefore, invariably stands on the middle of the road, while it is constantly washing away the sides. A road ought to be formed so as to induce travel over all parts of it. But with this great convexity, whenever a carriage is compelled to turn to the sides it causes great additional wear on account of sliding down the sides, while by this sliding tendency, being at right angles to the line of draught, the labor of the horse and the wear of wheels is very greatly increased. The evil of too great convexity is manifold, and a vastly better form is that of two inclined planes meeting at the centre, with the angle of junction at the top slightly rounded by a curve. Of course the exact inclination will depend much on the character of the surface and on the width of the road. A very rough and bad surface will require a greater incline than a hard smooth face, but no road should ever be allowed to be so rough as to require a transverse inclination greater than one in twenty, which for a road-bed twenty feet wide would make the centre six inches higher than the sides. With a broken stone or a hard unyielding surface, a proper medium of one in twenty-four is adopted, or half an inch to a foot. Telford, the most successful and noted road-builder of England, adopted one in thirty, or six inches curve in a road thirty feet wide, and MacAdam fixed upon one in thirty-six, and sometimes as slight as one in sixty, or only three inches crown in a thirty feet road.

The transverse slope should increase with the longitudinal inclination, and should always a little exceed it in order to prevent water from running down the length of the road to gully it out, but it must be apparent that no practicable amount of crowning or convexity would serve to carry the water from the slightest rut, not even if it were only an inch deep. And hence MacAdam testified before a committee of Parliament, saying: "I consider a road should be as flat as possible with regard to allowing the water to run off it at all. I have generally made roads three inches higher in the centre than at the sides, when they are eighteen feet wide." Now a dirt or even a gravel road may require a little greater inclination than the solid surface of broken stone, but if the road is so neglected as to have a soft or loamy surface, no amount of convexity will shed the water, and a very convex surface will invariably hold the more water.

It should be constantly borne in mind that any convexity at all is a necessary evil, and that the less it can be and accomplish its object the better for the travel.

Analogous to this great fault is the practice, often seen on a wide road and through a village street, of dumping down along the centre of the highway a kind of winrow of material, whether loam or gravel, eight or ten feet wide and from six inches to a foot thick and sometimes more in the middle, designed to form a crown to the road. If you ask what that's for, you will be likely to be told that it will all flatten down in a few months, and that it is the best way to drain the water off. You will observe that it drives the teams off to one side, often compelling them to cut up the grass along the gutters. It requires no argument to show that this is all wrong, both in principle and in fact, for this mass of stuff acts more like a sponge than like a duck's back, and you can never expect to make a permanently good road by leaving the surface in that way.

And this leads to another most common defect, which arises from the custom of semi-annual repairs, and that is the neglect to pick up and remove the small loose stones that are constantly working up through the improperly applied material to lie on the surface, to hammer up the road-bed at every blow of the wheel, and to endanger life and limb. Hard, firm rocks projecting above the surface are bad enough, and cause the resistance of collision, but other inequalities, loose round stones and other loose materials striking against the wheels are far worse, for they cause great loss of momentum and waste of the power of draught, for the carriage has to be lifted up over them by the leverage of the wheels. Any town that fails to remove such obstacles promptly and often, ought at least to be reported to the Society for the Prevention of Cruelty to Animals. No money can be better invested than in frequently removing the loose stones always to be found in a badly constructed road, and in snow-ploughs for a prompt removal of snow in winter.

But perhaps the most common defect to be observed in the methods of making repairs upon the roads is the total want of any proper attention to the drainage. You will see whole miles of roadway perfectly water-logged in spring, making it very difficult for light carriages to pass over them, and for heavily loaded teams quite impossible. The treatment for such sections requires to be radical. They need reconstruction quite as much as the worst portions of the South, and it needs quite as much skill and judgment to reconstruct, properly, roads that have been badly built, as it does to make good roads in the first place, and probably more. But drainage is one of the things that can be carried out in the course of repairing without any very serious outlay over and above what it would have cost to have drained them properly in the original construction of the roads.

There is no one point in which our highways are so lamentably defective as in being wet at the foundation. They need thorough drainage as the first step to any possible improvement in their permanent condition, and thorough drainage alone will in many cases make a good road out of a bad one, while without it no amount of labor will result in permanent improvement.

In many cases hundreds of cartloads of gravel will be dumped in to fill up a sinking slough, when perhaps half the money spent in drainage would have remedied the evil.

As a general rule there ought to be two independent systems of drainage for most common roads, one to control the surface water by means of side ditches and culverts wherever needed, and another to drain the foundation on which the surface or shell of the road-bed rests. For this latter, under-drains are most serviceable and properly laid tile-drains on the whole the cheapest, because they are most durable and effective, and being laid below the frost they continue to operate when the surface is frozen, and allow the road to settle when the frost comes out of the ground in spring without an entire breaking up of the surface covering to the infinite inconvenience of the public. Of course, this work, wherever it is done, is in the nature of a permanent improvement and could not generally be undertaken by a small and poor town on all its roads at once, but by taking a portion, or the worst portions, from year to year and doing them well, the roads in such a town would, in the course of a few years, begin to wear an entirely different aspect. The details as to how it should be done will be found developed at considerable length in the Prize Essays to which I have alluded.

One of the very common errors in the manner of constructing catch-waters or bars on steep grades, and one which often causes the traveller no little inconvenience, is to make them too high, and crossing the road often diagonally, so that the wheels strike them at different times with a shock sometimes sufficient to unseat the driver. If raised too high, also, they become dangerous for the horse. They should be made in the shape of an inverted V, with the point directed up the ascent, so as to divide the water.

Another very serious mistake in mending our roads, or rather in attempting to mend them, is to plough up the side ditches and throw the material, sods, sand and manure, which the rains have washed off into them, back into the centre of the drive-way. Absurd as this practice appears, it is quite too common in our country roads, and that, too, in many cases, where good road material is easily accessible. The consequence of it is, that the first rains convert this loose organic material, vastly better for a top-dressing for grass than for the surface of a road, into a perfect slough of mud, and a hard rain washes it back into the ditch. In a dry season this material becomes a perfect bed of dust annoying to the traveller, destructive to vehicles, and about as bad as the mud itself. No strength of language is adequate to do justice to the iniquity of this bad practice, and the surveyor who allows it ought to be complained of as an enemy to society. It is absolutely destructive to any good road, and it would be better economy for the town to throw the money directly into the ditch and let it lie there. It would be as reasonable to expect to improve the road by the application of meadow muck, and yet, I could point you to more than one large and wealthy town within ten miles of here, where, last spring I saw whole gangs of men doing this very thing, with garden hoes and spades, to cut and throw into the centre of the road the turf and mould and vegetable earth from the side ditches. The roads in those towns before that sad attack upon them were a standing disgrace to any civilized community, and yet I watched them day by day through the long summer only to see them sink lower and lower in quality till it became positively dangerous to ride over them.

Nothing is more certain, nothing better established by the experience of engineers and of practical men, than that a solid and unyielding foundation is one of the first requisites for a good road. And yet to throw such material as sods and sand and loam into the road from the sides, even if it is designed to cover it with a coating of gravel, is utterly destructive to the foundation of the road. All such stuff should be carefully thrown out of the road-bed, as the first and most important step in laying the foundation. The loose stones that have from time to time been picked from the surface and thrown aside to be an eyesore to every man of taste who travels there, constitute an infinitely better road material than the soil on which they lie. Sods and turf are often deceptively tough, and they seem " so handy " to fill a hole or a rut that they are used for the purpose without considering that they rapidly decay and work down into soft mud. But some go to the other extreme and fill up the deep ruts with stones put in and covered up in such a way as to conceal them at first, but so that they never wear uniformly with the rest of the road, but appear in hard ridges and bumps.

And here I must condemn the promiscuous use of the plough and the scraper in repairing roads. Common as they are, they should never be used in crowning up a road from the sides, and perhaps the only place where they should ever be tolerated on the road is in loosening and removing the tops of hills to reduce the grade by taking off the gravel, for their work, though large in quantity, is very poor in quality and in fact, destructive to the condition of the road, for the one breaks up the surface and the shoulders of the road which time and travel may have solidified, while the scraper drags up from the side ditches the soft alluvial matter previously washed into them, and leaves it upon the road, the very place of all others where it is never wanted and never should be allowed.

You will find on inquiry that the most common reason given as to why this vegetable matter is used is, that there is no suitable material handy. In some cases, like sandy locations and where long stretches of country occur, destitute of rocks and gravel, there is, no doubt, some shadow of reason in this excuse ; but I have often heard it where plenty of good gravel could be had, within a hundred rods, almost for the carting. And how easy it would be in most sections to remedy the difficulty by employing men by the year, to be always on hand to keep up the roads and to keep an abundance of material, crushed rocks, screened gravel, &c., on hand for use in various parts of the town. With but little if any greater expense than at present, with a more efficient and economical system, there need be no complaint of a want of material, certainly not in this part of the State. If there is a town within twenty miles of here that has not plenty of good road material, I should be glad to furnish it with six million tons of rock for nothing, and guarantee at the same time that there is no road material in the world equal to it.

Would it not be better economy for the town to invest a few hundred dollars in a good stone crusher and a heavy roller, to be kept on its town farm for use on the roads, than to pay men a dollar or two dollars a day to stand out their road tax, leaning upon their hoe handles upon the road? There are stone crushers, we have some about Boston, that will crush a ton of boulders an hour with a ten horse power engine, with the help of three or four men to throw the stones into the hopper and clear away the fragments. But, if you can't stand that, a medium laborer can break up from one and a half to two cubic yards of gneiss rock, or from a half to three-quarters of a yard of boulders or cobble stones a day, and it is work that can be done in winter and through stormy weather as well as at any other time.

Blake's stone-crusher, a machine of immense strength and efficiency, will crush seven hundred and fifty cubic feet of the hardest trap boulders into the best road metal in ten hours, with a nine horse power engine, and it has been known to break a hundred cubic feet in a single hour. This machine reduces the cost of hand labor for the same work about eighty per cent., and then there is the engine which can be used for putting out fires when not crushing stones.

Well, now, you may say a small town can't afford it. But you can buy a machine of six horse power for $800, and many a town loses more than that by the misapplication of funds every year, and its roads are growing no better very fast.

And how easy it would be to make this work the medium of one of the grandest charities which a small town has it in its power to bestow. There are few towns in which cases will not sometimes occur of men either bowed with age, or perhaps overwhelmed with the shadow of some great misfortune, who find themselves on the approach of winter destitute of work, though willing and anxious to do it. Perhaps they have families dependent upon them for the means of comfort. It is as hard, perhaps, for them, as it would be for you or for me, to be driven to the last resort, and apply to the town for help to enable them to get through the winter. A feeling of self-respect, some spark of which is still left, will make them dread to become town paupers. And isn't it vastly better to give them work to bridge over a few months, than either to give money outright or to send them to the poor-house? Wouldn't they be likely to remain better and more desirable citizens by encouraging them to retain their self-respect? Why not set them to work breaking stone into angular fragments, and preparing material to be used on the roads in the spring, and pay them a fair price, not by the day, but the piece, so much a cubic yard? The cost by cubic yards, both by machinery and by hand, is perfectly well ascertained, and the time it requires for different kinds of stone, and there need be no hesitation in fixing upon a fair compensation. You would not only save men from becoming paupers in many cases, but do the best thing for the town.

I should be glad, did time permit, to allude to other defects, which arise from neglect and often cause serious inconvenience, such as the want of sufficient and suitable guide-boards, and railings along the edges of embankments to insure safety; but I wish to allude to the system of laws under which the common practices alluded to have grown up, and by which the present evils are rendered possible.

In treating of the present system sanctioned by the statutes of the Commonwealth for the building and care of the roads, the most I can propose to myself will be to allude to some of the striking and common faults which arise from or grow out of it in the management and repairs of existing roads, and to show how many of these mistakes can be avoided.

1. One of the striking evils of the present system is the want of uniformity throughout the State, or over any considerable extent of territory. One town takes a pride in its roads, spends money freely, adopts a progressive plan of operations, and really secures very passable highways; and if all the adjoining towns would do the same the traveller on a long line of main road could get along very well. But the next town, perhaps, shirks its duty to the public, works out its highway tax by labor, a plan most skilfully devised to accomplish nothing, does as little as possible to enable it to just graze within the letter of the law, and the great public has to suffer accordingly. Now

see how this works. There may be a long stretch of road over which a team could easily carry a ton, or perhaps two tons. But in some part of the line over which the traveller has to pass, there is a long, steep and rocky hill, up which the team can draw only a half or a quarter part as much as it can easily draw on a level, hard and unyielding surface. The consequence is that on account of this one steep incline, or it may be more, the load can be only one-quarter or one-half as much as could have been easily drawn, but for such an obstacle. The teamster therefore loses a large part of the advantage of the good portion of the road, because he must reduce his load to what can be carried up the one or two miserable hills, which he must climb before reaching the end of his journey.

We have, therefore, the general proposition, that steep ascents being always injurious, become especially so when they occur on a long road which is comparatively level. In such a case, it becomes vastly more important to avoid or lessen the slope, or else to perfect its surface. But it lies in a town which does not care enough about its roads to improve them by reducing the hill, and the whole community has to suffer. If it costs the teamster more to transport produce, both producers and consumers of that produce are obliged eventually to foot the bill. Isn't that so?

And why should the condition of our great highways, which constitute so very important an element of the wealth, the comfort and the safety of the whole public, be allowed to depend on the short-sighted views of economy, or perhaps the indolence or indifference of every small town through which the roads may happen to pass?

2. Another great objection to the present system is that it allows towns to elect a multitude of surveyors without reference to their competency, who cannot by any possibility manage the money appropriated with that degree of economy, comprehensive foresight and wisdom of one thoroughly competent and skilful road engineer or superintendent.

The town meeting comes, and the people are called to vote for surveyors of highways, often without any previous consultation as to the competency of men to fill the position, perhaps by nomination on the spur of the moment, and many are chosen who have no adequate conception of the manner of performing the responsible duty assigned to them. Each has a certain district allotted to him, and not unfrequently, having an idea of fixing the road near his own place, he takes measures to procure the appointment for the special purpose of working on the road near home. The object is to do just enough to prevent the road from breaking his neck; an object altogether too selfish to admit of a proper regard to the public good. What better illustration could there be of the old adage that "what is everbody's business is nobody's!" Instead of doing a work which, of all others, has its times and seasons fixed by natural laws, they do it "when it comes handy," after the spring work is over, or at any other leisure time that will most suit their convenience. There are, there can be, no continuous repairs. "A stitch in time" has no application here. The fact that a dollar judiciously spent in repairs in April, or when the frost is coming out of the ground, is worth more than two, in June or July, and more than three or even five, at a later date, is of no significance where this plan is adopted.

Now, if this mode of management affected only the town which adopted and persisted in it, the evil would be of comparatively small consequence, but the main roads through a town are often great thoroughfares between other important points, so that the whole community suffers to a greater or less extent, for the want of an efficient head to do the thinking and the planning for the roads in such a town.

The worst feature of the whole is that no amount of ability or faithfulness displayed in the performance of the duties of a surveyor, will insure his continuance in office over one year. If he does his duty by making a good road, he will be quite sure to lose the position. All his experience and study and observation will be lost to the public when another takes his turn to undo what the former has done, and begins his apprenticeship at the expense of the public and of the condition of the road itself. In other occupations an apprenticeship, often of some years, used to be thought requisite to authorize a man to set up business, but a surveyor, the moment he is chosen, is presumed to be fit to direct works which often require much scientific attainment, great skill and intelligence.

Besides, the hasty appointment of surveyors, and the assignment of districts to each, with a specific amount of money to spend, leads to another kind of wastefulness. Some districts may have money to spare in the want of any knowledge or inclination to put it into permanent improvements, while others have too little. In one district teams will often be standing idle with a surplus of men, while, perhaps, in another there is a want of both. How can you expect any harmony of action with twenty or thirty men to do the work of one first-class, competent superintendent?

3. And again, that part of the present plan recognized by the law, by which the taxes are or may be *worked out*, is altogether out of date. It is unsound in principle, as Gillespie says, wasteful in practice, and altogether unsatisfactory in its results; a remnant of the times of feudal vassalage, when the tenure of land required the farmer to make the roads passable for the troops of the lord of the manor. And how absurd it appears on a moment's reflection. Men who may be skilful enough in their own occupations, are taken for the performance of work of which oftentimes they know absolutely nothing. A good ploughman is not necessarily a good watchmaker, and yet to build a good road requires more thought, more skill, more scientific knowledge, than to make a good watch, for the latter is an operation chiefly mechanical, while the former often demands the highest engineering attainment, and to spend money with the greatest degree of economy, even in repairing a common road, requires much judgment, knowledge of materials, and practical experience in using and applying them. And yet the law presumes that every man is competent to build a road!

And here allow me to quote a paragraph from one of the rejected essays. The writer says:—

> "I will give some facts which have come under my own observation. One of the towns of this State chose thirty-five surveyors, as usual, to superintend the repairing of its roads. One of them was a fiddler and had no other occupation at the time. He called out his men, seven old men whose ages ranged from fifty to seventy-five years. It was the custom of the town to add all unpaid taxes to the next year's bill, and some of these men had not paid their taxes for six years. They all went to work without any team, with their hoes, and had a jolly time, telling stories and

cracking jokes, while they reclined under the shade of the trees by the roadside. As the afternoon passed, the fiddler told them they had worked well, their taxes were paid and crossed out. And yet notwithstanding this squandering of time, the road was not materially injured, and the fiddler did infinitely better than some others who had teams, but ploughed in the wrong places, putting dirt where it was not needed, and leaving the road in such a state as to endanger the limbs and lives of all who passed over it."

Another writer of one of the rejected essays, an intelligent road surveyor himself, says:—

"This tax in labor I conceive to be the most injudicious method that can be devised for the repair of our roads. Every person called upon to work out his tax considers it an onerous duty and avoids it as long as possible, or at least his convenience seldom suits the convenience of the surveyor, and by the delays and uncertainties of having any one to work, the surveyor is obliged to neglect the needed repairs at the proper season of the year. In fact, it is almost impossible for him to comply with the requirements of the law as regards the expenditure of a certain part of his bill before a certain time, owing to the uncertainty as to whether his list of persons will work or pay, or he shall be obliged to return them as delinquents to the authorities, and draw the deficit from the town treasury.

"Again, if a person feels called upon to work out his tax he will do as little as possible, considering it fair play to do less on the roads for a day's work than at any other business, particularly as he gets nothing for it except the erasure of his name from the surveyor's book. I recollect well the first time I as boy worked on the roads, nearly half a century ago, seeing the men sitting by the sunny side of a bank in early spring, drinking their grog and telling stories a larger part of the time than they were at work on the road. And as a further illustration of the work tax, a worthy citizen was calling my attention to the condition of a by-road upon which he lived. I asked him how long since anything had been done on it, knowing that he had been one of the twenty-one surveyors of the town. Said he, 'I notified the men at a certain time to work on this road. They came and stood around all the forenoon, on which I told them that if they intended to *stand* their tax out, they should do it where people could see them, and I went on to another and more public road in the afternoon. That is the last work that has been done on this road.'"

You will perceive from these extracts, that men who are called upon to work out their tax on the road evidently consider such labor unconstitutional.

And yet, notwithstanding the evils of this bungling system, if system it may be called, which could not have been better devised to accomplish nothing, about one hundred towns in this State still cling to it. Is it any wonder that there is a universal complaint of its utter inefficiency? Is it any wonder that we have to wade through mud and mire in the spring and through dust in the summer, stumbling over rocks, with the endless wear of carriages, tear of horses and teams, and that we suffer the discomforts and annoyances which travelling over such roads implies?

These are only a few of the present defects of the system recognized by the statutes of this Commonwealth. There are many others which I have not time to enumerate in this connection. Now, how shall they be remedied or removed? It would seem that the change ought to be radical, that the medicine could hardly be too strong to meet so serious a case of disease; but lest the general sentiment of the community should not be found educated up to such a treatment, I will allude to one or two milder, half-way measures at first, which would clearly be an improvement upon the present state of things, and then say what seems to me to be required to effect a complete change in the present system.

And first, the law might require that the whole supervision of roads should be vested in the board of selectmen, who should be obliged to appoint a thoroughly competent superintendent, who should hold his office for a term of years, not less than three, and perhaps not more than five, subject to removal only for good cause shown, to whom should be committed the entire responsibility of the repairs of roads, and who should have a sufficient force of workmen constantly employed to make permanent improvements and to keep up the roads. Nothing is better or more clearly proved by the experience of the past, than that the plan of annual or semi-annual repairs is totally inadequate to keep up the roads, though it is undoubtedly the most expensive and wasteful of the public money.

It might be well also, to require by law that at least one-half of the money raised should be devoted to making permanent improvements, using the balance each year to keep up such parts of the ways as could stand the delay, picking out loose stones and otherwise keeping them in a passable condition, till their turn came for a more perfect treatment.

This would be one plan. Another would be to authorize or require the towns to elect a road-master, under whose direction all the surveyors for the year, whatever the number might be, should work, and to whom alone they should be responsible after their election by the town. He should also be elected for a term of years with a liberal salary, to be fixed either by the law or by the town at the time of his election. He should be required to give his personal attention to all the important alterations or repairs of the highways, and generally direct the time and the manner of the performance of all labor done on the roads by the surveyors or those under their employ, reporting in writing at the annual town meeting with a statement of what had been done, and suggesting the requirements of the roads for the future.

Another plan would be to authorize the towns to elect a board of say three commissioners, in the same manner as school committees, who should hold their office for a term of years, to whom should be committed the whole supervision of the roads, and who, so far as the construction, laying out and repair of roads go, should hold the position already suggested in speaking of the selectmen. Being chosen with special reference to fitness for the position, they might be more competent than any board of selectmen chosen for other and more general duties.

Another still better plan, perhaps, would be to authorize or require the towns to appoint a skilful road engineer, with all powers, rights and duties suggested for the superintendent, and which are now exercised by the highway surveyors. He should be required to perform all the duties relating to laying out, altering and repairing the highways, which now devolve upon the selectmen. His plans might be subject to the approval of the board of selectmen if thought best, or be submitted to the town for acceptance.

Still another plan would be, as suggested by one of the writers of the essays already alluded to, to require each town to appoint an inspector of roads, to act in concert with two, three or more similar inspectors from adjoining towns, and also three agents in each town to make the repairs of roads, one to have the entire charge of repairs on the main roads, for instance, and the other two to have control of needed repairs on cross roads, all the roads being divided, perhaps, for convenience, into first and second class.

The three, four or five inspectors so appointed should be required to pass over the main roads in company with the agents, and point out to them in detail the manner in which the roads should be repaired. To save time and money, the inspector for each town might have the supervision of the cross roads in his own town, and the same direction over the agents having charge of those roads which the board of inspectors had over the agent having charge of the main roads. After the repairs are made, it should be the duty of the inspectors to pass over the roads and see that the work has been properly done, with the power of acceptance or rejection, according to circumstances. These inspectors might be chosen by the towns or appointed by the selectmen, and in case an agent proved himself to be incompetent, the inspectors should be required to report him to the selectmen, who should be empowered to discharge him and appoint a temporary agent in his place.

These are a few of the simple changes that might be made to secure greater efficiency, the labor tax or the commutation system being entirely abolished in either case. They are at best only half-way measures and liable to some of the objections of the present system, such as local prejudices and interests, and political pulling and hauling in the election or choice of the officers suggested, by which the best interests of the public might in some cases be sacrificed to party intrigues.

It is proper, however, to state that one of these proposed methods has stood the test of a practical application in the town of Waltham, ten miles from Boston. That town, with fifty-one miles of roadway, has had a superintendent of roads for the last dozen years, and the cost for repair of roads and sidewalks on the average for the seven years previous to 1865, was $3,357, and for the last five years $7,000, and few towns in that neighborhood had roads and sidewalks so uniformly good. A committee of the town of Brookline, sent to investigate the plan and its results with reference to its application in that town, reported that the rate of cost or expenditure is less than one-fourth the cost per mile of the Brookline roads, while the material is no better and the travel quite as destructive as in Brookline.

The superintendent of roads in Waltham describes the method so successfully adopted in that town as follows:—

> "The town owns three good horses, with carts, snow-ploughs, tools, &c., valued at the time the statement was made at $1,200. A competent person is appointed to take charge of the work, heretofore at a salary of $600 a year. His duty is to manage the teams, direct the men, &c. There have been usually employed eight men in the summer months and six during the winter, at wages varying from $1 to $1.12½ in summer, and 60 to 75 cents in winter. Most of the time in winter is spent in digging gravel, preparing it for use, and drawing it to places of easy access, so that during the summer season a street or way can be speedily and neatly repaired. The preparation of gravel in winter I consider a very important feature in our success. During the short days of winter the workmen can excavate and prepare more road material than during the hot days of summer, and the stuff is ready for instant use, so that a spot needing repair can be mended before it becomes very bad from continued wear. In early spring, as soon as the frost is fairly out of the ground, the workmen go over the road with picks and hoes, filling ruts, cleaning out drains and water-courses, and picking off the loose stones. Any bad spot is noted, and as soon thereafter as practicable such a spot is mended. From April to December, at intervals of about six weeks, the workmen pass over all the roads and streets, and pick up and remove all the loose stones and rubbish found thereon. During the very hot weeks of summer it is so managed as to employ the men about culverts or other similar works, so as to relieve them from the very severe labor incident to other work connected with the department."

It will be noticed that this plan insures a constant oversight over all the roads, and this, after the roads are once properly constructed, is unquestionably the best economy, and costs less, in a series of years, than that of semi-annual repairs. It is the only way, in fact, by which a road can be kept constantly in good condition.

Now after all, as I stated, the plans which I have suggested are what might be called only half-way measures, which might be adopted as modifications of the present system, with the understanding that the fundamental principle which underlies them all, and which is based on the truest and most far-sighted economy, is "*to sacrifice a portion of the resources of the road, or the money raised for roads, to insure the good and judicious employment of the remainder.*"

A far better plan, it seems to me, is that suggested in one of the prize essays published by this Board.

> "For the efficient and economical maintenance of the public roads, it is essential that there be a uniform system of management common to the whole State. The first step towards a complete reform of system would be the creation of a State department of roads and bridges, to have general charge of all the roads, to arrange and direct the carrying out of the details, and generally to look to the effective working of the system.
>
> "The chief of the department should be a practical civil engineer, thoroughly conversant with the art of road making. For the purposes of proper supervision, the State might be divided into districts, say by counties, and these again into sub-districts, larger or smaller as might be found expedient.
>
> "There should be a resident engineer or superintendent for each district, to have charge and oversight of the roads and bridges within his district, and to be held accountable to the chief of the department.
>
> "He will ascertain the condition of the roads in his district, determine what improvements are to be made and in what order, decide upon the kinds and amount of work to be done, estimate the sums needed to carry it on, and at stated periods report the same, with all the matters pertaining to his office, to the chief of the department.
>
> "For each sub-district there will be required an assistant-engineer or road-master, subordinate to the resident of the district, to manage the working details, within the limits assigned. As the improvements progress, these sub-districts may be enlarged and the number of subordinates reduced, so that each and all shall always have work enough to keep them occupied."

And here, gentlemen, I leave the subject in your hands; with the suggestion that as I have felt it my duty to call your attention, in the main, to the defects and evils of our present system, it will remain for you to point out its beauties.

Mr. J. F. C. Hyde, of Newton. I ought not to talk just now, because I endorse all that has been said by our friend, and the talk will be all on one side. I was in hopes to hear from my friend right opposite (Dr. Loring), whom I have charged with being on the other side.

It is true that it was my misfortune, or fortune, to be appointed on the committee to award the prizes for these essays. It was done at Pittsfield, in my absence, and I should never have accepted the position, if I had known what it involved, for we had about thirty essays to wade through ; some of them very good ones, and some of which I cannot say so much. I think that our excellent Secretary has studied those essays to some purpose, and I can say of his most admirable address, that I endorse almost the whole. I do not know how it is possible for any man who has not been able to give the subject more attention than I suppose he has, to write an essay so acceptable to me, however it may be to you.

If there is any one subject on which I feel a strong interest to-day, it is that of roads and road making. I am a new convert, for I stood by the old system until I found I could not defend a single feature of it, and then I had to abandon it. I consider it fortunate, on the whole, that I had to read those essays, and had to devote considerable attention to the subject, for I hope I may be able to exert some little influence in my own neighborhood in causing better roads to be constructed and the old roads to be repaired in a better manner.

Mr. Flint asks some one to point out the beauties of the old system. I cannot do it, for I do not know a single beauty which it possesses. Those who are fond of narrow and crooked rural cart-paths and lanes, as some of my friends are, may do it, but I cannot. Perhaps I cannot do better than refer to my own town of Newton, which I think I may say, without egotism, is one of the best towns in the State of Massachusetts. The town of Newton formerly had the old system of electing highway surveyors. They were often chosen by nomination at large, the moderator putting the first name that happened to catch his ear, and that man was elected, whether competent or not ; so that we had very many incompetent men as highway surveyors. It was a notorious fact, and many of the gentlemen before me who are more or less familiar with the operation of repairing highways well know, that very many of those men were utterly incompetent. In some cases, men sought the office to accomplish their own private purposes. I know one instance in a neighboring town where a man wanted to be elected highway surveyor in order to cut down the road in front of his house, which he did at an expense of several hundred dollars, and when he had done that, he went out. I know another instance in Newton where an utterly incompetent surveyor cut down the road, causing a large amount of damage ; and afterwards the town had to fill up where he dug out. I could give instance after instance of that kind. You will agree with me, I think, that such men are not competent to fill such positions.

I see some Newton gentlemen before me who have taken a great deal of interest in our roads. We were in that town in just this condition. Some gentlemen were converted and felt that we could make an improvement there, and among others our excellent friend, Governor Claflin ; and these gentlemen urged a change of system. Some were reluctant, myself among the number, to have this change brought about, but a change was finally made, and a plan adopted like one of those suggested by the Secretary, and I suppose the reason he suggested it was that other towns might go and do likewise, and not make a sudden and great change ; for you know that some of us have strong prejudices, and because our fathers did so and so, we like to walk in some degree in their footsteps. You know that in town meetings we run against the prejudices and honest convictions of a great number if we propose radical changes ; so we adopted this plan of having town teams,—I believe the town of Newton now owns some eight or ten horses,—and placing them at convenient points, mostly at our almshouse, and putting the highways wholly in charge of the selectmen, who are the surveyors, they being authorized to employ a superintendent of highways, who is the principal man in the management of the roads, though he is under the general control of the selectmen. Some of those teams were stationed at Newton Corner, some at the almshouse, and from those points they went out to repair the roads. There were rural districts at the extreme southern limits of the town where the teams of farmers were employed. We have not had the old system of working out our taxes upon the highways for some years, and I think that is the most abominable system that could possibly be devised. When I was a lad, I worked upon the highway under that system. I did not like to work very well, but I do believe I worked about as many hours as the rest of them, for they did not do much work any way. But that system, as I said, has long since gone by in Newton.

Not satisfied with that, we then took another step forward. On one side of us is Waltham, where they have most excellent roads, under the direction of our friend Carter. On the other side is Brookline and West Roxbury, both places having most excellent roads (Brookline the better of the two). We have not a large extent of road, perhaps somewhere between ninety and a hundred miles. We found we must have something more than this, so we purchased a stone-crusher. We have in our town a great deal of stone in certain localities, and we purchased a stone-crusher with a thirty horse-power engine. It is one of the Rawson & Hittinger crushers ;—the Blake crusher is a good one ; I have nothing to say against it. We placed that stone-crusher where there is a great quantity of stone which was taken out of the Cochituate Aqueduct, and we have been able to get out from sixty to eighty tons a day with three men besides the engineer ; and that material is being carted on the roads at proper seasons. It has been carted in front of the residence of a gentleman whom I see here, who is fully competent to discuss this question. Then we purchased a heavy roller, for without a heavy roller you cannot have all the advantages of macadamized roads ; that is required, and we have purchased a roller, but it has not been used as yet to any considerable extent.

The radical defect of all the Newton roads, and many of the roads in that vicinity, is their narrowness ; and this is not likely to be improved while the county commissioners lay out the roads fifty feet wide, though they make the roadway only twenty-two feet in width, and insist that it shall have a rise of a foot or more in the twenty-two feet, without requiring any drainage of the road whatever, except simple culverts across where water is likely to accumulate on one side or the other of the road. No matter what the soil may be over which the road goes, no county commissioners, so far as I know, require the least under-drainage. You will see, at a glance, that it is utterly impossible to make a good road over certain soils without suitable drainage to begin with; an enlightened road-maker would no more think of undertaking to do it than one would think of improving his meadow without putting a drain through it. Our roads were narrow to begin with, like hundreds, perhaps thousands of miles of road in Massachusetts. It has been my privilege to drive over the roads of many towns in Massachusetts, with a carriage, where there is but a single track, and you have got to look a long ways ahead to see where you can turn out if you are approaching another team. There are many roads where it is almost impossible to turn out. I found one place in Massachusetts this last summer where I could not drive my broad gauge carriage past another vehicle without running it off on one side up the side of a ledge. I said, that was the first difficulty. Then again, in Newton, roads have been built just as they have everywhere else, very poorly, without taking off the soil at all; but simply by the use of the plough, the scraper, and the shovel, rounding up and turnpiking the road with all the soil underneath, so that when teams are driven over it, they soon wear deep ruts, into which, in the spring and fall of the year, the water will settle and make a horrid road. That is the condition of all the roads that have been made in this shilly-shally way. Then rounding and turnpiking the road to that extent is a great evil. The most perfect road I have ever seen in my life is the Chestnut Hill Reservoir road, in Newton and Brighton. It is eighty feet wide; I presume there may be six inches rise in that eighty feet. It is a macadamized road. I know it cost a good deal; I understand that, and I propose to show that it ought to cost a good deal, and that any place which wants such a road as that can well afford to pay for it. I do not expect that a little town up among the mountains, whose valuation is not more than half a million of dollars, can afford to build a road costing six or eight thousand dollars a mile. I understand that; but, if you want to see a perfect road, go and see the Chestnut Hill road. It is perfectly drained, macadamized throughout, the roller has been used faithfully, and the road is just as perfect as it can be. It is as perfect as the finest concrete walk when it is in its best state. Now, what have they got to do to keep that road up? They have got to do just what our friends on the other side of the water do. They have their little piles of rubble on the side of the road, with the highway surveyor constantly on the watch, and any defect is immediately repaired, on the principle that "a stitch in time saves nine." It costs but a mere trifle, and the road is kept in perfect condition. It is true, there are but few towns in the State that could afford to construct a road like that, and there are few places where such a road would be wanted,—eighty feet wide and perfectly graded ; but there are many streets that could be graded in that way. It is true that it would be expensive, and the objection is that towns could not afford it. Now, the motto which I adopted many years ago, and which I still believe in, was, "what is worth doing, is worth doing well." If you cannot make but a mile of road this year, make that mile. I can remember when the whole appropriation in the town of Newton for roads was but a very few thousand dollars ; it was thirty-five thousand last year ; and I was told the other day that they proposed to recommend fifty thousand dollars for the next year. I hope they will recommend that sum, and we shall begin to have pretty good roads. Let us have just such roads as are needed in the particular locality ; if we need an eighty foot road, costing $6,000 a mile, let us build that.

And now I ask, right here, what has made Dorchester, Brookline, West Roxbury, Somerville, Waltham and Newton, so popular as they are ? I will not speak for the other towns, but I will speak for Newton, though it may seem egotistic ; but I speak as I think. I say that one of the causes which have tended to build up that town and make it popular is its excellent roads. I go still further ; I say, if we do not maintain good roads, we cannot keep the wealth and population there. It was my misfortune to be sixteen years on the board of selectmen. The last few years, no matter how busy I was, I could not allow a loose stone upon the surface a week without being called upon to pick it off. I visited, not long ago, one of the thriving towns of New Hampshire, where they ought to know better, and do, and I will undertake to say that they have not picked a stone out of their streets for the last ten years. It was actually unsafe to drive a horse through the streets ; and yet they take summer boarders, and charge them good round prices, too. These are the two extremes. I say no town can afford to have poor roads, for the reasons I have given ; and I undertake to say this,—that if a town will have good roads and appropriate money to keep them in thorough repair, they will find it for their advantage; their property will be enhanced in value enough to pay for the outlay.

I do not mean to say, I repeat, that a little town away back here with half a million of property, or the town of Newton even, with its twenty millions of property, can afford to build 80-feet highways and macadamize them all this year or next. It would put a debt on the town that it could not bear. But I say they can afford to improve their highways. All the towns throughout the State can afford to change their system. I would go for a change at once. I believe the legislature ought to take up this matter, and declare that no town shall adhere to the old system of working out their highway taxes; that point gained, it is something. Then there are several plans proposed by intelligent engineers and others, to bring about an improvement of the roads throughout the State. I am not competent to decide which is the best plan of those suggested, but let us so impress this matter upon the people of the State, that they will wish to begin to improve their roads, as I think they can in various ways. I know it is almost impossible in some cases. A gentleman said, coming up in the cars: "How are you going to improve the road from Truro to Provincetown, where the land moves about every day; where it is taxed in Truro, and by the time the tax is collected, it has got down to Provincetown?" I know it is difficult. The way they get a road down there is by going back into the pastures and tearing up the whortleberry bushes, like a leather apron, and spreading them over the sand. But I submit it to you whether Provincetown could not afford to send to our friend Flint, who says he will furnish plenty of material to macadamize any road, and have some of this material shipped at once and put their highway in good condition? I ask you if it would not be good economy in the end? It strikes me so. But, in most cases, it is not necessary to transport the material that distance. In many towns of the State, there is plenty of material that would need to be carted but a few rods, which, if properly applied, would make these highways permanently good. I do not know how long the Chestnut Hill road will last, but I will venture to say that neither you, nor I, nor our children, nor our grand-children will ever live to see that road in as bad a condition as the average of roads in this State. Is it not good economy to secure this permanency? Why, I could speak of certain towns in our neighborhood which neglect their roads. I know where there was a piece of road in Brighton, between Newton and Brookline, over which it was almost impossible to draw a load, and there was constant complaint of it. It was just such a case as the one referred to by Mr. Flint. Here was a good piece of road, then a very bad piece, and then a good piece again, and invariably the farmers had to throw off a part of their load when they came to this bad place, when a few hundred dollars (for it was only some half a mile long) would have put the road in prime condition, and they could have hauled their load the whole distance. Is it not a matter of great importance, when we are building railroads and endeavoring to develop the resources of the State in every possible way, that we should furnish the very best roads we can to the railroad stations and to market? If a railroad company should do as we do, neither you nor I would dare to ride over their road. They adopt the system that England, France, Belgium and other countries have adopted for the repair of their roads, that is, they keep men constantly on the track; not a spike can get out that they do not see. That is just the place we want. The town of Waltham and Newton and other towns about there keep men constantly employed. The work is so arranged that the men are engaged in the winter as well as in the summer. In the winter the crushing is done; in the hot weather they build the culverts; in the spring they put on the rubble; in the fall clear out the culverts, and so on. There is no time wasted. It is all employed in one way or another in improving the road. The same system carried throughout the Commonwealth would give us roads that would add immensely to the value of property in their vicinity. The Hon. William Jackson used to say—(and here is one prejudice we have to encounter, and I presume you all have, the unwillingness of people to give land for a road of sufficient width)—the Hon. William Jackson, of whom many of you have pleasant recollections, who was a shrewd and sagacious man, once said, "Gentlemen, your land is worth more in your street than in your enclosure, up to a certain width;" which in those times was 60 feet with him, and yet a good many of us have not got up to 60 feet yet.

The fact is, this matter needs no argument upon my part. Every man familiar with the city of Boston to-day knows what an immense amount of money they have spent in widening their streets. Take Hanover Street, for instance, and many other streets, and see at what an immense cost it has been done. Why? Simply because, a great many years ago, somebody persisted in laying out a narrow street, believing that if it was wide enough for that generation, it would be wide enough for all time. How strange it is! I want to enlarge upon this matter of the width of streets, because it is one of great importance, and it seems to me people take a very narrow view of it. A little street was laid out in a certain town, running diagonally (which certain'y is a bad way), and I was opposed to it, but that did not make any difference. Among other objections which I urged was this. I said it was contrary to our plan for the town; but they said, "Well, this will answer our purpose for a good many years to come." "So it will," I said, "but not a hundred years hence, or five hundred, or a thousand years hence." They laughed at me, and I don't know but they had a right to laugh, but it does not strike me so. When we are laying out streets, we should remember that we are laying out those streets for all time to come. Take the city of Boston, or Springfield, or Worcester, or any other city. Their streets are laid out and they will remain streets as long as the world stands or those cities exist. You say, "We can widen them when it becomes necessary," and so we can. Go to Newton Corner, where I could buy land a few years ago for $50 an acre, which is worth to-day from 33 cents to $1 a foot, and when it becomes a city, and is more closely crowded than now, the land will be worth $3, $5, or $10 a foot. You can widen the streets then, it is true, but it would only be at an enormous expense, whereas you could have laid out streets of ample width for comparatively nothing a few years ago. As a general thing, where streets are laid out, those who want them laid out are willing to give the land, because they do not consider it of great value, although they are not generally willing to give it wide enough; but it can be had at a small price.

I say, then, in closing, let us have wider streets to begin with, and in constructing them, let us have them properly drained. Many of us do not need any talk about this. How often have we driven along, in the spring of the year, over a flat road, turnpiked up, and every time the horse stepped, up would come the water, showing the road to be as full of water as a sponge; only for lack of drainage—nothing else. You and I and all of us believe in draining meadows, and we talk a good deal about the advantages of draining. There is no place where drainage can be done to so good advantage as under a road, in many localities certainly. Then let us have the road-bed constructed of sufficient width. I do not believe county commissioners are up to this work when they order roads graded only 13 to 22 feet wide, and it is a positive fact, that there are miles of road in this State that by express order of the county commissioners have been graded but 18 feet, and there is no room for more than one track. Twenty-two feet is the maximum. That is wide enough where there are only two or three carriages passing a day, but it is not wide enough in a town like Framingham, where there are from 300 to 500 passing a day. Then as to the construction of these roads. I know there are towns that cart gravel long distances, where the actual cost of the cartage merely is a dollar and a half a load. They think it is good economy to do that, and so do I. I believe it would be economy to cart it at five dollars a load (though I would rather cart stone), rather than use the material on the ground, such as was referred to by Mr. Flint; that is entirely unfit to be put into a road. Then let us have thoroughly drained roads; let us put on proper material. If the town can afford it, if it is a main road that is to be travelled a good deal, let it be macadamized, by all means. I will not speak of city streets, because that is not a matter which concerns us so much; but the main thoroughfares in country towns should be macadamized, and there are comparatively few towns in the Commonwealth where there is not stone, hard and soft (and the harder the better), that can be had for this purpose. Then let us go a step further. Having obtained this, having built the road just as we want it, let us give it that care and attention that these first-class roads receive. It is said that, in some parts of Europe, the rubble is left in little heaps along the roads, ready to be used when wanted; so in the winter, when we are not doing much, we could cart this rubble and put it along these main roads in little heaps, 50 or 100 feet apart, and then it would be very little work to repair a break.

Think, too, what a satisfaction it is to drive over that Chestnut Hill road. I would not advise you to go there on Sunday; I should rather you would go to church; but I suppose there are from 3,000 to 4,000 teams on that road every Sunday in pleasant weather in summer. Why do they go there? They go there because it is the best place to drive that I ever saw; because it is a real pleasure to ride on a good road. It is magnificent; it is fine as it can be. We all believe in more or less pleasure travel, certainly about the large cities and towns, and there is nothing more attractive than a good road. There is no one thing that will bring more people into a town than the fact that it has the reputation of having good roads. Then, aside from that, look at the teams that must go over all these roads. I remember going from Yarmouth to Provincetown in a stage with two horses (I never want to go there again in that way), and the stage, which had only one passenger, had to stop every 20 or 30 rods going up the sand hills. But some friend will say, " we can't afford to build good roads down there." Look at it. That is one extreme. I will venture to say that a good horse, such as there are hundreds of in Boston, will draw three tons over the Chestnut Hill road. That is the other extreme. I submit it to you, all things considered, whether they cannot afford to do it. Whether it is economy to have a road over which a horse can draw three tons, or to have a road over which he can draw 500 lbs., or perhaps but 250 lbs., besides the carriage.

I understand very well that some will say you cannot have these perfect roads in every town. Then I say, put your standard as high as you please, and come as near to it as possible. If we cannot get a perfect road, let us make it as perfect as we can. At any rate, let us take hold and mend our ways in some degree.

The chairman can tell even greater stories of Dorchester than I have told of Newton. I know that these results are not owing entirely to the fact that we have good roads; I know there are other influences at work; but this is among the prominent influences which have produced the result.

The Chairman. We have a gentleman with us who is posted on all occasions, and speaks ably upon any subject of which he treats. I allude to my friend, Dr. Loring, the president of the New England Agricultural Society. Shall we hear from him?

Dr. Loring discussed in a somewhat elaborate manner the various modes of road making, recommending system and economy, and the avoidance of any centralized organization which might interfere with local wants and interest.

Hon. Richard Goodman of Lenox. As the mountain towns have been referred to, I may as well, coming as I do from a mountain town, give expression to our views in regard to mountain roads.

I apprehend there are few of us who will differ in the main from the views expressed by Mr. Flint and Mr. Hyde. It will not be denied, I think, that the present system of making roads is inimical to the best interests of the Commonwealth, whether in the mountain towns or any other parts of the State where it is carried on by any labor except that of competent hired labor, paid in money. But, sir, the main question which we want to discuss here, I apprehend, is as to the mode of remedying these difficulties; and notwithstanding the observations of my friend, Dr. Loring, as to the practice abroad, perhaps we may gather as much information by the light of past experience, whether coming from abroad or at home, as in any other way. I apprehend that we are really as badly off as they were in Europe at the end of the last century. They had roads there about equivalent to our present roads here. Many of them impassable, almost, in winter; muddy at this season of the year, and impossible to get through in spring. We find that in Scotland, as late as 1730 (a country with as sparse a population as we have now), they had roads of the same character, and they never obviated that difficulty until they began to improve them upon a certain system, and that system was the same which has been carried out in France and in England, as distinguished from what they called in France the *corvée* system, which is a system where the taxes are worked out on the roads. We find from the records of France, that when that great minister, Turgot, the minister of Louis XIV. came into office, it was costing about four times as much to repair their roads by the old system as it afterwards cost when the money was raised and used for the purpose of putting the roads in order. In France, the government took possession of all the roads, and kept them in order. In England and in Scotland, the roads are in charge of a board of public works in each country, and there are commissioners who go about and direct the surveyors elected in the parishes (corresponding to our highway surveyors) how the roads shall be built.

I will not pretend to say that all the roads in this Commonwealth should be put in condition equal to the roads described in Newton and some other towns; we could not afford to go at once into that expensive way of constructing our roads, and it would not be necessary; but I will pretend to say that there must be a homogeneous system of perfecting the highways before we can have any complete system of thoroughfares which will satisfy the public. In addition to that, we must make a distinction, which I think my friend Dr. Loring has not made. We need not put all the roads in this excellent condition, but we must make a distinction between cross-roads and what are commonly called highways. I can answer for Berkshire, that we are more neglectful in regard to our roads than the people in any other part of the Commonwealth, and we shall be so, just as long as the matter is left to the selectmen or highway surveyors selected by the town. Take the road from Lenox to Pittsfield; I doubt if anything has been done on that road for fifty years to improve it permanently. I have lived there for near a dozen years, and it has been just about the same one year as it was the year before, and it could not be worse. It reminds me of what Arthur Young, the great agriculturist, in 1780 said of the road from Liverpool to Manchester: "There was no word in the English language which would express its nasty and miserable condition." That road from Lenox to Pittsfield is in such a condition, that a man who never swore before will swear when he passes over it, and he who swore before will swear still more.

I merely take this as an example. Now, what is the remedy? See what towns, situated as Lenox is, are losing. We have a large number of people who come from Boston and New York during the summer. The principal place to do their shopping is Pittsfield, but half the time it is impossible to get there with a decent carriage. The result is, that there is a great loss of trade in Pittsfield. Then, again, there is a great loss to Lenox, because people do not come there when they find that the roads are so impassable that they cannot ride for pleasure. We spend on our roads some $1,200 or $1,500 a year, and a good part of it goes on to the end of our road—some three miles. This has been so certainly for the last twelve years, and I apprehend it has been so for fifty years. That money is all thrown away, because, as Mr. Hyde has well expressed it, the work is not well started to begin with, and it is not well done. Now, that sum of money, expended every year under the direction of a competent board of surveyors, or commissioners sent out by them, would give us, in a few years, if only half a mile was built every year, a perfectly constructed road, which would last for half a century, with very little expense. So far as that part of Berkshire and a good part of Western Massachusetts are concerned, there is the same difficulty, I apprehend, and we shall never get over it until there is some competent authority which can compel the men who are elected to take care of our roads, to manage them as they should be managed. It is all folly to talk of the selectmen of our various towns doing the work, or appointing competent men to do it. You know the selectmen of these various towns have the least possible knowledge in regard to the building of roads; and with us, it is an impossible thing to get a man who understands how a road ought to be made; and our roads have always been, and they always will be (until we get some competent men for highway commissioners), in such a condition that we cannot pass over them with any comfort. It is just the same with the county commissioners; most of them are respectable men, but very few of them have any acquaintance with the construction or repairing of roads. If any gentleman will go to Amherst, he will see a specimen of road making which, I apprehend, is unique in any part of the world, and disgust him with the idea of giving to county commissioners the ultimate authority in such matters.

Mr. Howe of Bolton. The only reason for that was, they had State aid.

Mr. Goodman. I hope, then, State aid will be withdrawn, and the commissoners, too. That is only one instance. What we want, I say, is some head that can perfect a system ramifying through the State, under which all the towns shall be compelled to make their principal roads on the same system. I would have that plan carried out until we have thoroughly good roads through the Commonwealth. I incline, therefore, to no middle way; I do not believe the old adage will apply here: "*In media via est salus*"—in the middle way is safety. What we want is just such a system as Mr. Flint has suggested, carried into practice, and our selectmen compelled to make good roads.

The CHAIRMAN. We have with us a man who has had a good deal of experience in travelling at home and, of late, in Europe; I allude to Hon. CHARLES G. DAVIS, of Plymouth.

Mr. DAVIS. I do not know that I have voice to make myself heard, but I wish to say merely, as you have alluded to my having been absent of late, that when I returned home a few months ago, after a year's absence, I learned one thing which gratified me exceedingly. The first thing I did was to look up our Agricultural Report for the last year, and in it I found the three prize essays which I devoured immediately, and I said to myself that the Board of Agriculture and the Legislature had done more by drawing out those essays, than by any and all other public acts that had been done in Massachusetts, during the last five years. And I said it to myself, with some feeling, because I had been more impressed in travelling, not through Scotland and England alone, but through the different countries of the Continent, both in the poor countries and in the rich ones, by the excellence of the roads than by any other single thing. I do not think that it makes much difference—although we have our ideas, and I have mine upon the subject, and mine are pretty radical—I do not think it makes much difference as to what particular mode of correcting the present evil we discuss. I think it will be sufficient if we call the attention of the people of Massachusetts to this subject, and have it discussed thoroughly. Then, where there is a will there will be found a way.

I believe one of the greatest troubles is to know the difficulties under which we labor, and I think Dr. Loring will agree with me and with Mr. Goodman, that the chief trouble to-day consists in the fact that those who have the care of our roads do not know what a good road is. They have no standard to go by. They have no standard of excellence, nor have they any knowledge of the best way to make a road, suppose they have had the time, materials and money necessary. For instance, the other day, I saw a surveyor, in my own town, grading up the road by the water side, immediately in front of Plymouth Rock. He had to grade it up some two feet and he was actually filling in chip dirt. I called his attention to it, and told him that would not make a road. "Oh," said he, "I am going to cover it over with gravel," and he did, some two or three inches deep, and left the chip dirt to rot under it. That man thought he was doing a good thing. He was getting rid of the chip dirt, if nothing else. The trouble I find, is, that our selectmen and highway surveyors, as a general thing, are ignorant of what a good road is, and what would be the best way to make a good road, if they had the material and the money. If we can teach them how to build a good road, in the first place, we do a good thing. In the next place, we have got to teach the people of Massachusetts, that the road which costs the most, the money being judiciously expended, is the cheapest in the end. Mr. Flint does not propose, I do not propose, in calling the attention of the people of Massachusetts to this matter, to lead the towns into debt. We do not propose to ask them to lay out as much money, in the next twenty years, as they would lay out under the present system. Why, Mr. President, it is the interest on the capital that we have to lay out yearly which creates the debt. The capital which the taxes upon our road represent, would more than suffice for all that the most sanguine desire in regard to the improvement of our roads.

As Mr. Flint says, what we want is highway surveyors whose minds, in the first place, are upon the subject; we do not have them now. We leave this matter to selectmen, who have other duties to discharge; or to surveyors, who are farmers, or woodchoppers, or engaged in different avocations, and when they have spare time and can spend a little money upon the road they do it. In the first place, we do not have officers with any knowledge upon the subject; and we do not have the minds of the people on the subject except occasionally. That, it seems to me, is the great and radical defect in the present system. I do not care whether we undertake to make State engineers to have the care of our roads, or whether we undertake to educate every man in the community to know what roads ought to be.

The question is which of the two you can best accomplish. I think every man ought to learn to be a much better road-builder than he is, and if you could get your surveyors to appreciate a standard, it would be a great gain. But you cannot do even that. You could not get one-half of your surveyors to read the prize essays in the last report; or, if they did read them, they would say, "That is a standard we cannot come up to."

What are the facts abroad? It is the poorest countries in Europe which have the best roads. I will not say that it is so in all the countries of Europe, because I have not been into Spain; but in Switzerland, it is not the Simplon road merely, it is not the roads alone over the passes of the Alps, that are good. Why, those roads would be cheap at $100,000 a mile, and they would probably cost more than that if they were made in our day, with our system of labor and wages; but, as I have said, they would be cheap even at that price, because they made that which was before inaccessible, accessible, and opened up land which was good for nothing. They made avenues where there was no avenue, and where, but for these roads, there could be no avenue. I do not care whether you go among the Alps, or into the valleys, you will find everywhere, even in the poorest cantons, good roads. They are not wide roads. I agree with Dr. Loring in that matter; I think twenty-two feet, well built or worked, is wide enough for our common country roads. You never find a road in England made wider than that, except near the cities. The highways through the country towns are more like narrow lanes than roads: they are not more than twenty or twenty-five feet between the hedges. Not being in danger of obstruction by snow, and having no sidewalks,—as most of them have not,—they are sufficiently wide for their purpose. But go to the poorest canton in Switzerland, much poorer than any district in Massachusetts, and you find the roads made always with even grades, never with a pitch or a hollow to suit the natural surface of the country, but always upon even pitches up and down, sometimes bridging across dry valleys, the engineering and masonry of the most excellent character. Those roads are constantly watched, as a mother watches her child, as the track-men upon our railroads tend the track that the engines pass over; watched day by day, and swept week by week. This is done, not alone that the dust may be swept from the roads, but to prevent, when wet weather comes, the accumulation of mud, which softens the road underneath, and finally tends to make holes.

I found such roads as these all over Switzerland. You, Mr. Chairman, can bear me witness, and Mr. Flint also (and there are others here who have been abroad), that the roads through Belgium, through France, most of Germany, and through Baden especially—which are referred to in the prize essay, which I hope most of you have read—are as smooth as this floor, and smoother than any sidewalk in this country. I say that thing is possible in this country. I believe that is possible with a free and independent democracy, which is possible with the democracy of Switzerland.

I have no doubt that many of you gentlemen are incredulous; you think me an enthusiast, but I speak of what I have seen, and I have no doubt that the county of Berkshire, which has not the difficulties to surmount that Switzerland has, might, by the judicious expenditure of the same amount of money which is squandered now, have as fine roads in twenty years as any country on earth. It is this waste which we want to stop; it is this ignorance which we want to enlighten. This is not a matter of dollars and cents; it is a matter of intelligence, it is a matter of science. The money will come fast enough if we only have the intelligence to use it, but that is what we have not got, under the present system.

Allusion has been made to Provincetown, in my own section of the State. Let me say to my friend, Mr. Hyde, that those roads have been greatly improved since he was there, and I say that Provincetown is entitled to more credit for what she has done for her roads than the town of Newton is. She devoted the whole of the surplus revenue which belonged to her, to the laying of sidewalks in the town. She imported the soil from the main land, if I may so call it, and to-day the main road through the village of Provincetown is as good as that of any town in this county. And as to the highways in Barnstable County, let me tell you there are few better highways in the State than that from Sandwich to Barnstable, and from Barnstable to Yarmouth. We can make good roads even there if we try. The only trouble is where there happens to be a mile or two of road through the forest, where there is no gravel fit for the purpose of road-making. It is no light matter to cart gravel to that spot.

I think that until we can get a law through the legislature, which will entirely revolutionize this whole system, we can do something in our several towns. And the first thing we should do is to use our influence to get the control of the roads out of the hands of the surveyors. In our town we have about three hundred miles of road, I think, and I don't know but more, and the practice is for those who are surveyors, or who desire to be, to form a ring almost every year and vote that the town shall choose highway surveyors, and then vote themselves in; but once in a while we get through a vote giving the selectmen power to appoint a surveyor of the roads. A year ago we passed a vote that the town should own a horse and cart, and keep a man employed all the time on the roads. We have tried that system a year, and there is not a citizen in the town who will not tell you that the roads anywhere within three-quarters of a mile of the village, are in a better condition than ever before, and we have saved thousands of dollars by the use of that one horse and cart, and the committal of the oversight and repair of the roads to one man. I only speak of that as an illustration of what may be done by a little change; and I do think, that now that our State has become so thickly populated, and our towns so near together, that it is for the interest of every man that the roads of the town next to him should be as good as those of his own, and that we have a right to call upon the State to adopt some general system of engineering, constructing and repairing our roads. And upon this point let me say one other word —I think that the effort should not be to multiply our roads. I think our county commissioners make a great mistake in giving a road to almost everybody who asks for it. Let them perfect the roads we have and there will be no trouble about those who come after.

Now it is almost universally the case (and this is another difficulty in our present system), that you find the highway surveyor has no sort of engineering knowledge, and takes no engineering advice whatsoever, and anybody who watches a hillside road from year to year, for a series of years, will soon notice improvements which might have been made and which would have remained permanent if only the advice of an engineer had been taken.

Adjourned to Wednesday, at 9½ A. M.

SECOND DAY.

The Board met at 9½ o'clock, and Dr. LORING was elected chairman for the day. He introduced as the first speaker Prof. JAMES LAW, of Cornell University.

THE PRINCIPLES OF BREEDING.

BY PROF. JAMES LAW.

Mr. Chairman and Gentlemen:—Year by year the interest in our live stock deepens, as we realize the increasing importance of its production and conservation as a branch of agricultural industry. The westward march of empire, and the laying under contribution of our vast western prairies for the production of breadstuffs, combine with the more general diffusion of improved and valuable breeds, to demand the exercise of the highest intelligence, and the most advanced and correct knowledge of all that pertains to their improvement, or to the maintenance of their most estimable qualities.

At the foundation of all excellence in stock lie the principles of breeding. Error here, however venerable or deeply rooted, is especially to be regretted, as, like the spores of the cryptogam in the planted seed, it will fructify in the growing product and blast the harvest, in spite of the most careful tending and culture. He who avails of the rich experience of the past hundred years, reaps his substantial reward in the yearly increasing value of his stock, while the man who ignores or despises it soon realizes in his barren fields and stunted, unproductive herds, that what is not *well done* is not worth doing at all.

The better to illustrate the known facts and principles which enable us to control the breeding of animals, let us glance shortly at the organisms through which reproduction takes place. In all the higher animals this is by the union of the products of the two sexes, the *ovum* or *egg* of the female and the *spermatozoon* or vitalizing element of the male. In the female the two ovaries produce *vesicles* from birth, like those in which the ova afterwards grow, but until they reach the *bearing* age these do not mature, nor are true *ova* produced. When the system has sufficiently matured to afford a surplus nutrition for the reproduction of its kind, an increased supply of blood and nervous energy to the ovary hastens the maturity of one or more of these vesicles; they burst as a ripened fruit must fall, and the liberated ovum, descending the Fallopian tubes to the womb, finds that the new-born activities of that organ have elaborately prepared and fitted it as a home for its development in the immediate future.

In healthy females, from the approach of maturity to the decline of life, when many other functions as well as the reproductive ones are lost, this development and discharge of ova persists, and with it the power of generation. Heat or rut is the concomitant of such rupture and escape.

But without the addition of the male or fertilizing element to the ovum, its escape is but the prelude to its destruction, as it no longer retains in itself the power of assimilation and increase, but is thrown off, together with the exudation in the womb, as a waste and useless thing. The male semen is an albuminous fluid secreted by the two testicles, and in health discharged only during strong sexual excitement. It contains myriads of minute organisms (spermatozoa), bearing a strong resemblance in most animals when magnified, to tadpoles, and having a similar but much more active power of motion. These last elements appear to be the true fertilizing agents, as Spallanzani found that the fluid obtained by filtering the liquid had no power to fecundate the ovum, whereas the material left on the filter proved successful. Moreover, these are the only elements in the male seminal fluid having the innate power of motion, and since in animals killed a day or two after coition the ovum is found in the Fallopian tube, undergoing that segmentation and division of its yolk which results from impregnation, and is besides surrounded by spermatozoa, there can be no reasonable doubt that they alone are the fertilizing constituents. Further, the spermatozoa are found in the testicles, the removal of which destroys the power of procreation, and have not been found in the semen of mules and other barren males.

FORM OF THE OVUM AND ITS DEVELOPMENTAL CHANGES.

As discharged from its ovarian (Graafian) vesicle, the unimpregnated ovum is a globular mass, with an external granular layer of club-shaped bodies (granular layer); within this a layer of transparent albuminous matter (Tona pullucida); still more internally the spherical yolk granules, among which lie the *germinal vesicle* with its *germinal spot.*

Until fertilized it is incapable of change. The first indications of development are shown in the segmentation of the yolk into two equal masses, of these into four, of those into eight, and so on, the numbers doubling each time from the binary segmentation of each cell until the yolk is largely increased in bulk, and presents a uniform mass of granules, and a smooth investing membrane. At the commencement of this segmentation of the yolk, the germinal vesicle and spot disappear, and in the mammalous ova has hitherto eluded all attempts to trace it, though it has been pointed to as the centre of this work of segmentation and increase in the yolk. At the same time the spermatozoa can be seen in the membranes surrounding the yolk, and even in the yolk itself, as may readily be seen in the rabbit's ovum, taken sixty hours after connection with the buck male.

When the segmentation of the yolk is completed, there appear new developmental changes at one point of its surface, and in the membrane (germinal membrane) investing it. This consists in a thickening of the membrane in the form of an ovoid, in the centre of which the rudimentary elements of the young animal soon become apparent.

We have thus glanced at the main points of the phenomenon of impregnation. We have traced the steps resulting in the union of two living elements, derived from different animals, incapable of separate existence, but potent when combined not only to lay the foundation of a living being, but to insure that this being shall develop the qualities of the male and female from which it sprung, alike in form, size, color, vigor and power of enduring hardships, constitution, mental powers, and even proclivity to disease. This point must never be forgotten in connection with subsequent developments, that here, in the initial stage of the individual existence, all the characters of the future animal are determined by the unseen but not the less real properties of those two simple germinal structures—the ovum and spermatozoon. These have no less individuality and character than the animals from which they sprung, and as the ovum and spermatozoon of the rabbit and horse do not appear to differ materially from each other, we are here brought face to face with one of the mysteries of creation, a mystery which we can no more explain than we can explain why in the adult being one cell or particle of living matter should always abstract from the blood and elaborate into tissue the materials of bone, another those of muscle, and another of nervous tissue.

MEMBRANES OF THE FŒTUS.

Our present purpose does not demand that we should trace the development of the ovum in all its stages into the fœtus. I hasten, therefore, to note the connection of the fœtus with the mother, and how it is nourished in the latter period of gestation.

The fœtus floats in one water bag (Amnion) enclosed in another (the Allantois), which among other functions fulfil that of protecting the young animal from being injured by the movements of the abdominal organs, or by external objects coming in contact with the abdomen, and that of steadily dilating the external generative passages by a soft, equable and yielding pressure, preparatory to the expulsion of the fœtus. The Amnion likewise receives any dejections in case the bowels act before birth, while the Allantois is the receptacle for the urine which is conveyed from the anterior extremity of the bladder through a special channel (uracus) in the navel string. Outside the Allantois and lining the womb is the vascular coat (the chorion), whose functions are the most pertinent to our present purpose. The blood of the fœtus is conveyed to this membrane by the two umbilical arteries, branches of the internal iliacs, and after breaking up into capillaries in its substance is returned by the umbilical vein. Branches are given off from these vessels for the nourishment of the three membranes, but the blood is mainly distributed on the villous process of the chorion to absorb the nutrient matters from the blood of the mother.

NUTRITION OF THE FŒTUS.

The inner surface of the mucous membrane of the womb, even in the unimpregnated state, is perforated by numerous orifices leading into two kinds of uterine follicles, one consisting in simple depressions terminating in blind ends, the other consisting of elongated tubes, usually spiral, and smaller tubes branching off from their sides like the ducts of a compound secreting gland. These uterine glands are abundantly supplied with blood by a rich network of capillaries in thin walls, but are functionally inactive until conception has taken place. Then they undergo a great increase in size, become increasingly vascular, and secrete the nutrient matter for the support of the fœtus. The outer fœtal membrane, the chorion, develops villous processes, on which the blood-vessels especially ramify, and which fit accurately into the uterine follicles. These villi may be seen in the afterbirth of the cow to have numerous small secondary villi branching off from their sides, and corresponding to lesser tubes of the uterine follicles.

In ruminants, the uterine glands are not scattered over the entire surface of the womb, but accumulated at about fifty points on little rounded elevations, connected with the wall of the uterus by a narrow neck, and known as cotyledons. These cotyledons increase to a diameter of one or two inches after conception, and the villi of the chorion are aggregated into an equal number of cotyledons, which thus fit into the uterine ones.

We have thus brought into the most intimate relations, and over the most extended surface, the rich network of capillary blood-vessels in the uterine walls, and the equally rich network on the outer membrane of the fœtus. The maternal and fœtal vessels are only separated by a delicate membrane and a single layer of cells.

The secretion of these glands in the cow and ewe have been analyzed by Prevost and Morin, Schlossberger and Arthur Gamgee. The annexed tables will show the nutrient nature of the fluid :—

Analysis of Uterine Milk.

REACTION.	SCHLOSSBERGER.		ARTHUR GAMGEE.			
	OF THE COW.		OF THE COW.		OF THE EWE.	
	I. Acid.	II. Acid.	III. Alkaline.	IV. Neutral.	V. Alkaline.	VI. Alkaline.
Specific gravity, . .	–	–	10.33	10.40	10.31	10.33
Water, ...	88.07	88.03	87.91	86.12	88.30	91.88
Solids, ...	11.93	11.97	12.09	13 88	11.70	8.12
Fat, ...	1.59	1.52	1.23	1.40	1.20	1.05
Albumen with cellular structures, . .	9.63	9.57	10.40	11.65	9.50	6.12
Alkaline albuminates, .	–	–	.16	.30	.47	–
Salts, ...	.71	.70	.37	.40	.45	.82

Uterine Milk of the Cow.—(PREVOST and MORIN.)

Water in 100 parts, ...	86.837
Solids, ...	13.163
Albumen, Fibrine, &c., ...	11.028
Gelatiniform matter, ...	.546
Ozmazone, ...	.714
Fat, ...	.750
Salts undetermined.	

CAUSES OF STERILITY.

One of the troubles of breeding is an occasional *failure to procreate* on the part of the male or female, and this lecture would be incomplete without a reference to such an unfortunate occurrence and its more common causes.

In the *male* sterility sometimes follows a too early and excessive use. The calamitous abortions in the dairy parts of New York have been shown to be slightly more abundant where male and female alike have been bred for generations at too early an age. Confining our attention to the male, we see that the spermatozoa are developed in the secreting cells of the testicle, that they require a certain time for development, and that if sexual connection is too often repeated, these are no longer discharged, or are emitted in an immature condition, the fluid being mainly or entirely composed of the secretion of the seminal vesicles and other glands situated along the course of the urethra. This condition is likely sooner to occur in young, partially developed animals, in the very old, and in those in low condition, and weak constitutionally, or as a result of overwork, starvation or other debilitating influence. Such weakness is indeed oftentimes associated with an absence of spermatozoa in the semen.

The case is the same if the testicles are but partially developed, and in all cases in man or animals in which the testicles are retained in the abdomen or the inguinal ring, in place of descending into the scrotum, microscopic examination has failed to show the presence of spermatozoa. (Curling, Goubaux.) Disease of the testicle or of its excretory duct, whether inflammation which permanently impairs the structure and functions of the secreting organ, or fatty change in pampered animals, which unfits it for secretion or emission, is an insurmountable barrier to procreation. Fatty degeneration may sometimes be overcome in its earlier stages by increased exercise, and spare diet. But starvation is not to be advocated in ordinary cases. The animal, whether male or female, that shows the most vigorous health, being neither too obese and plethoric, nor too thin and weak is likely to be the best stock-getter. I have seen two flocks of sheep put to the same ram, kept in the same field, and on the same diet, yet the flock which was in the best condition from previous good feeding produced twins in almost every instance, and several triplets, whereas the poorer, but by no means low-conditioned flock barely reached the average of one lamb and a half to each ewe. The male, subjected to a severe drain by frequently repeated connections, demands a rich, nourishing diet, as well as a moderate amount of exercise to maintain his vigor, stamina and generative power.

Local troubles sometimes lead to temporary impotence in the male. Excessive and painful erection from a too frequent use or some other cause of irritation, such are catarrh or ulceration of the sheath of the penis or of the urethra, usually contracted from the diseased female, or from one served too soon after parturition, and while the consequent discharges from the womb or passages continue, paralysis of the penis from blows or otherwise; sprained loins, spavins, or other malady of the hind parts which tortures the animal when he mounts.

The *female* often conceives with difficulty, if she has not been used for breeding in early life, and hence many follow the rather questionable policy of putting her to the male at as early an age as she comes in heat, no matter how young. The New York abortion reports show the danger of this, in weakening the constitution, and above all the generative organs, when persisted in for a succession of generations, and when the young animal is milked after the first calf. A celebrated Scotch breeder of Shorthorns, however, Mr. Douglass, of Athelstaneford, asserts that neither constitution nor stamina suffer from breeding at a year old, provided the heifer is abundantly nourished during pregnancy, and is not milked during the succeeding year.

A second cause of failure is serving too soon after parturition—in the mare for instance two or three days after foaling. The womb has oftentimes not fully contracted at this date, a condition not conducive to conception; and it too commonly still discharges a muco-purulent matter. Now the presence of pus in the womb or passages is found to be fatal to vitality and movements of the spermatozoa; so that until this has ceased it is folly to put to the male. Connection in these circumstances has the additional disadvantage, as we have already seen, of frequently inducing disease in the male.

Over-excitement of the generative organs, whether from excess of highly stimulating food, plethora, or disease of the organs may stand in the way of conception. Hence it is found that bleeding before putting to the male often calms such irritation and secures a successful result. Low feeding before and during rut in animals showing this tendency will sometimes succeed, and waiting until heat is passing off will equally favor conception. A system practised in Arabia of sweating a mare before presenting to the horse may have been partly suggested by its influence in distracting attention and thus quieting sexual excitement, though it may on the other hand have been resorted to with the view of calling out the full vigor of the dam at the time of conception in order to perpetuate it.

Obesity in the female as in the male, is a cause of sterility.

Fatty transformation of the ovaries prevents the evolution of the *ova*, and fatty deposit in the Fallopian tubes opposes the descent to the womb of such as may be formed. This is above all noticeable among our Shorthorn cattle, and may be prevented or even cured in recent cases by changing the diet and regimen. Captain Davy succeeded in getting such heifers to breed, by turning them out on a bare common with a young bull, or by using them in the plough, and Mr. Webb was equally fortunate with two valuable barren cows, after walking them over one hundred miles to his farm at Babraham. In animals disposed to the production of fat, any excess of hydrocarbonaceous food (oil, starch, sugar) will endanger the breeding powers, but curiously enough sugar in man and animals alike has been found to be specially productive of sterility.

Other diseases of the ovaries or womb besides fatty degeneration will destroy fertility. Thus cows with tuberculous deposit in the ovaries, though in continual sexual excitement, and ever ready to receive the male, are incapable of procreation.

The tendency to barrenness is increased by too close breeding, but of this cause I will speak later.

A female is often sterile, because of a rigid closure of the neck, of the womb, the result of spasmodic contraction or of disease. Mares previously barren have often been rendered fruitful by dilating the neck of the womb by the fingers and thumb drawn into the form of a cone, and passed through the opening just before putting to the horse. If too rigid to be opened in this way it must be incised with a knife fitted into a grooved handle (a bistoury), and the opening maintained pervious by a sponge tent until healing has been completed. In cases of this kind I have experienced the advantage of using the largest female speculum prolonged by a tube of sheet tin.

It is sometimes advised to allow repeated connection in order to secure conception, and doubtless in the natural state coition is usually repeated a number of times. But as we keep animals in an unnatural state, and have changed their forms and functions to serve our own ends, this is no reason why we should not conserve the powers of a valuable male, that we may multiply his value in a more numerous progeny, if one service is found to be sufficient, rather than that we should be wasteful of his powers by squandering them unduly on a limited number of females. The myriads of spermatozoa discharged in a single act, amply suffice to render the ovum or ova prolific, provided there is no obstruction to their entering the womb and being there retained. At the same time, during great sexual excitement, such obstruction is at times met, or the semen is discharged after having entered the womb, and a second connection when the excitement is less intense will prove more successful. But as some females will take the male after impregnation, and as connection in these circumstances often causes abortion, the female should not as a rule be presented to the male more than twenty-four hours after having been first served.

Ergot, smut, weakened constitution, digestive and urinary disorders, resulting from improper feeding of breeding animals, fright, mechanical injury and other causes of abortion, need only be mentioned here as additional causes of sterility.

FUNDAMENTAL PRINCIPLE OF BREEDING.

To turn from the consideration of the mere production of animals to the production of valuable breeds, we find that the foundation of all success lies in the common aphorism *like produces like*. As the acorn develops into the oak, and the wheat into the wheat plant, as the horse, ox, ass, sheep and pig reproduce their respective kinds, so are the corporeal, constitutional and mental qualities of particular animals reproduced in their progeny. The rule holds alike as regards good qualities and defects—the bone and sinew, the fire and vigor of the race horse; the muscular development and energy of the trotter; the weight, strength and activity of the Clydesdale; the placid eye, loose-build, heavy hind parts and large vascular system of the Ayrshire; the rounded form, early maturity and fattening quality of the Shorthorn; the sweet, juicy mutton of the highland breeds of sheep; the fine wool of the Southdown, or merino, or the early maturity and fattening qualities of the Leicester.

Perhaps no better example of the hereditary transmission of valuable qualities can be found than in the English thoroughbred race-horse and Shorthorn. The Duke of Newcastle and Mr. Fenwick are reported to have said in Cromwell's time, that "the meanest hack from Tangiers would produce a finer progeny than could be expected from the best sire of the native breeds." And since then the world-renowned English racer has been produced mainly by crosses from the best types of Arabs and Barbs. From the Byerly Turk descended King Herod, which got four hundred and ninety-seven winners at the various race-courses, computed to have gained to their owners £201.505. Eclipse from the Darley Arabian, got three hundred and thirty-four winners, which brought their owners £160,000. The basis of excellence was laid by infusing the blood of the Turk, Barb and Arab, yet by a careful selection of animals showing superior qualities, the progeny has so far improved that the native Arab is now considered no match for the English racer, but is allowed a discount of thirty-six pounds when contending with the latter in the Goodwood races. As showing a similar improvement over native breeds, it may be mentioned that no "cocktail" (seven-eighths or fifteen-sixteenths racing blood) has been known to win a race of 2½ miles in competition on equal terms with the thoroughbred.

The Shorthorns equally date their origin from the bullcalf Hubback, purchased by Colling from a poor neighbor. And so well have the qualities of early maturity and power of accumulating fat been perpetuated and improved, that no grade Durham, however excellent his personal points, is of the same value for begetting the same qualities in his progeny. And yet this excellence has been obtained in the case of the racer in about two hundred years, and in that of the Durham in one hundred.

But the fundamental principle that *like produces like*, is not an inviolable rule; were it so every breed would retain the same qualities throughout all time and no improvement could be effected. Variations always take place, sometimes from unknown causes, sometimes from causes under our control; and in our ability to solicit, to foster and to perpetuate such variations, lie all our powers of improving a breed. As these variations may be the cause of deterioration as well as of improvement in breeds, an intimate acquaintance with them and their results is absolutely essential, not only to beget new excellence, but to maintain and perpetuate the old. I will recount a few of the known causes of variations.

1*st*. *Feeding*.—Under a more abundant diet the intestinal canal of the domesticated cat and swine becomes more lengthy and capacious than those of their wild progenitors. Hogs allowed to run wild on the bleak Falkland Islands, have reverted in form and other characters to the type of the wild boar; not so with those turned adrift on the rich soil of La Plata, or Louisiana. A similar result took place in a pig of Nathusius, seized at two months old with a disease of the digestive organs, which permanently interfered with digestion and nutrition. Though a highly bred Berkshire it assumed the long snout, the coarse bristles, ridged back, flat sides and long legs of the wild boar or unimproved breeds.

So with the native cattle and sheep of the bleak mountains of Scotland and Wales, of Kerry and Brittany, which have degenerated to the smallest types of their kinds. The fat-tailed sheep of Kurdistan is said to lose its fatty rump when removed to Russian pastures. The ponies of Norway and Sweden, of Iceland, Shetland, Wales, Devon, Brittany, Corsica and Sardinia illustrate the same point. The horses running wild on the Falkland Islands have degenerated to ponies within a comparatively recent period.

Conversely a richer food increases bulk. Ayrshire cows removed at four or five years old to the richer land of the Lothians increase marvellously on the better keeping. The wonderful excellence of the Durham cattle was no doubt rendered possible by the rich pastures of the Ouse and Tees, and is now maintained by the artificial and forcing system of feeding so common in such herds. So with the English racer; he is grained from the very earliest age, and to an extent which would fail to be remunerative in ordinary priced horses. At a month old he gets a quarter of a peck daily, and the amount is steadily increased with his growth.

When we want to develop bone, muscle and vigor, this rich and dry feeding is demanded, but where rapid growth and early fattening only are desired, as in animals for the butcher, then a softer and more aqueous but equally nutritive diet is essential.

2*d*. *Climate* is not without its influence on variation. Certain races can't survive in particular climates; they must change their characters or die out. The Newfoundland dog has lost most of his distinctive characters in England. He has not hitherto been able to survive in India, nor at the Cape of Good Hope. Greyhounds, pointers and bull-dogs rapidly lose their distinctive forms and mental qualities in India. The third generation of the bull-dog has acquired a sharp nose, thin body and hanging ears, and his native pluck is equally gone. The Thibet mastiff, taken from his native mountains to the humid plains of India, speedily dies out.

Horses, as we have seen, fall off in size in bleak islands. The same appears to hold concerning very humid countries, as in the Falkland Islands, and to the east of the Bay of Bengal, in Pegu, Ava, Malabar, Siam, the Eastern Archipelago, and most of China. They on the other hand attain their greatest native excellence in a clear, dry climate, like that of Northern Africa.

Shorthorns removed from England to Ireland are found to become more hairy and coarse in their coats. A once celebrated breeder of Shorthorns on this side the Atlantic, when remonstrated with for keeping his cow-houses so warm, tersely remarked that he "could better afford to lose one of his herd at intervals than to render them hardier at the expense of some of the excellences due to the forcing system."

It was attempted to breed high class Leicester sheep on the bleak Lammermuir Hills, in Scotland, but they deteriorated so rapidly that the attempt had to be abandoned. At Angora not only goats, but shepherd's dogs, and cats, have fine fleecy hair (Ainsworth). The sheep of Korakool lose their black curled fleeces when removed to any other country (Burnes). The European sheep loses all its wool except on the loins, after the third generation, in Antigua and the west of Africa, appearing like a goat with a dirty door-mat on its back (Nicholson). In the lower heated valleys of the Cordilleras the wool of the sheep becomes thin and hairy, unless frequently shorn. Changes of a lesser degree take place in the wool of sheep kept in different localities in England, as well as of those taken to Australia.

These rapid changes are but indices of the more extensive ones to which climate has largely conduced in producing the many widely distinguished varieties of animals native to different localities.

3d. Soil.—The influences of feeding and climate are closely allied to those of soil. A rich soil abounding in limestone appears essential to the full development of the larger and more improved breeds of animals. Mr. Thorn, Dutchess County, N. Y., gave up breeding Shorthorns because of the deficiency of lime in the soil. The same breed has been found to degenerate on the poorer sandy soils of Massachusetts unless allowed a liberal artificial diet. The good effects, however, of soil, climate and diet may be to a large extent obtained by careful housing, local drainage, a warm southern exposure of buildings and parks, and a liberal system of artificial feeding.

4*th*. *Excessive Use of Parts.*—This, if it does not unduly exhaust the vitality of the part and its power of nutrition, will certainly determine an increased development. This is indeed a wise provision in the animal economy, to strengthen an organ to perform the work demanded of it. We have a familiar instance of its effects in the blacksmith's arm, or in the professional dancer's leg. The extraordinary development of one kidney when the other has been destroyed is equally characteristic. A patch of inflamed skin (*i. e.* a pimple on the face) afterwards grows long hair; a cock's spur transplanted to his comb grows to four or five inches long (Hunter). Hard work increases the thickness of the scarf-skin on the hands, pads form on the knees of the Ceylon sheep, which kneel to browse the short herbage, and a new growth of bony matter is thrown out on the concave aspect of a rickety and bent bone. These may be all referred to the stimulus offered to nutrition in a more abundant determination of blood and nervous energy to the part, and the changes seen in the whole body in other cases are equally the results of a more general stimulus to nutrition. Thus, in the horse we have demanded the utmost exercise of muscle, bone, brain and nerve, and have produced animals with an extraordinary combination of these elements and of their legitimate fruits, speed and endurance. In the Leicester sheep, the Berkshire and Essex pigs, and the Shorthorn cattle, we have fostered and stimulated fat, bulk and early maturity, till we have all the energies of the system devoted to their production, and in Ayrshires we have solicited the flow of milk till the udder and accessory organs have drawn to themselves all the available powers of the being.

5*th*. *Disuse of Parts.*—Conversely, parts thrown out of use, waste, as witness the arm carried constantly in a sling, the muscle on the outside of the shoulder joint sprained and disused in so-called *sweeney*, and the wasting of paralyzed muscles generally. Tame rabbits have the hind limbs shorter than wild ones. If Tanner is correct in saying that the lungs and liver of high-bred Durhams are lessened, it would merely indicate a result of the general tendency to lay up hydro-carbons and fat rather than burn them up for animal heat.

These five influences which I have named are well under our control; we can apply them on generation after generation, and thus increase and perpetuate many of those properties which we most desire. Other causes of variation there are which are less under our control, but which it is none the less important we should study and avail of when occasion serves.

6th. Imagination.—Under this head naturally comes up the question why the best of Laban's cattle produced a ring-streaked and spotted progeny after Jacob had set peeled rods in front of their watering troughs, and notwithstanding that all the parti-colored cattle had been carefully removed from the herd. How much was miraculous and how much a natural conseqence, we don't know. That God took this means of blessing his servant does not necessarily imply that he made use of other than the already existing physiological laws, and intensified them as when he now cheers the land with an abundant harvest.

Though it is often attempted to throw discredit on the influence exercised over the child by the imagination of the pregnant mother, yet the general opinion on this subject has undoubtedly a foundation in truth, and its importance is frequently verified by occurrences among domestic animals.

Dr. Trail Monymusk, Aberdeen, mentions the case of a bay mare which worked, was stabled and grazed with a black gelding having white legs and face, straight hocks and long pasterns, so that the feet seemed to be set at right angles on the legs. Covered by a bay horse she produced a foal exactly like the gelding in color and shape, and especially in that of the legs.

Mr. John McGraw, Ithaca, N. Y., had a beautifully formed trotting mare covered by a horse of the same kind. The mare pastured during pregnancy in the next park to a mule, and the foal shows an unmistakably mulish aspect about the head, ears, thighs and gait.

Mr. Mustard, Forfarshire, had a black polled-Angus cow served by a bull of the same breed, but the calf was black and white, and horned like an ox with which the cow had pastured.

Mr. McCombie of Tillyfour, had twenty polled-Angus cows served by a polled-Angus bull, and all had pure Angus calves except one, which, threatened with barrenness, had been sent to starve on another farm, where she grazed with a yellow and white ox. The calf was yellow and white.

Mr. Cruikshank of Littyton, had twelve white calves from his roan and brown Durhams after whitewashing his steading to ward off pluero-pneumonia in 1849. He never before had more than two in one year and always sent them away. A similar occurrence took place in a Yorkshire herd the same year.

Though this impressibility would appear to be restricted to a very small minority of breeding animals, yet its occasional existence should make us careful how we bring animals of improved breeds into intimate or exclusive relationship with stock of less desirable qualities.

This impressible state of the mental faculties in the brute may assist in explaining another phenomenon in breeding.

7th. The effect of the first sire on succeeding progeny.—Haussman long ago noticed that mares bred to an ass, and subsequently to a horse, had the qualities of the ass preserved in the second and third foals. Lord Morton put an Arab mare to a quagga, and two successive foals thereafter by a black Arab horse had the striped skin, the dun color, and the short bristly main of the quagga. So with the Hampton Court mares served by Colonel, and the following year by Actæon, the colts in the latter case bore a striking resemblance to Colonel. A polled-Angus heifer served by a Durham bull showed the effect on her next succeeding progeny by a polled-Angus bull, the calf being evidently a cross in shape, in color, and in having horns. (McGillivray.)

Dr. Wells, Grenada, had a flock of white ewes put to a chocolate colored, hairy ram, and next year, though served by a ram of their own breed, they produced lambs allied to the chocolate ram in color and texture of fleece.

Mr. Shaw, Lochell Cushine, Aberdeen, had part of his ewes put to a Leicester, and part to a Southdown ram, and the following year, though served by a horned Highland ram, the lambs showed extensively the stamp of the two polled rams in their dun faces and lack of horns.

Mr. Giles put a black and white Essex sow to a chestnut wild boar, and this sow breeding afterwards with an Essex boar, had chestnut pigs.

Among dogs the same result is notoriously frequent, though it must be confessed there are usually more sources of fallacy with these creatures.

These remarkable results may be due to mental influence alone, though it would be difficult to disprove the theory that the system of the mother is impregnated or inoculated by elements absorbed from the offspring she bears. We know nothing, it is true, of any function but secretion resident in the placental surface of the womb, but as absorption and secretion both take place from some other glandular surface, and as the organic germs of infectious diseases are taken up from the surface of the lungs, we cannot consider an animal membrane as an insuperable obstacle to the absorption of infinitesimal particles of living animal (germinal) matter. A third explanation may be sought in the sympathy between the functions of the ovary where the germs of the next succeeding progeny are then being developed, and the special processes going on in the womb and its contents. A striking example of this sympathy we have in the ruptured ovarian vesicles which increase and remain till after parturition in cases of pregnancy, but rapidly disappear if conception does not take place. If pregnancy influences the empty vesicle why not the growing one, and with this fact before us, it is absurd to suppose that the peculiar conditions of one pregnancy will affect the ova then being developed.

But whether this theory or that is the correct one, it will not change the fact that the earlier offspring often stamps its character on the next succeeding. This is practically important to us, and knowing it we can guard against its possible evil effects.

8th. Atavism.—Reversion.—Breeding back.—The tendency to this is seen in all families, human and brute. The child often resembles grandparents or great grandparents, uncle or aunt, in place of its own parents. Polled-Angus, Galloway and Suffolk cattle which are hornless, occasionally produce a horned calf. The same is frequently seen among the hornless Southdown sheep. Even the purest bred Leicesters will sometimes show patches of gray on the face, as if they had been crossed with Southdown. Black noses are far from unknown among the best bred Durhams.

Rev. Mr. Cox had a flock of spotted Spanish sheep which bred true among themselves, but always got black lambs when crossed with Leicesters or Southdowns.

Sidney saw, in a litter of Essex pigs, the exact counterpart of the Berkshire boar used twenty-eight years before to give size and constitution to the breed.

McCombie's Durhams continue to get white calves, though none such are ever retained on the farm.

Every class of animals is liable thus at times to revert to its original type, though as shown in the case of Mr. Cox's sheep, they are more liable to do so when violently crossed than in the ordinary course of breeding from one family or from several nearly related. A second example of this was afforded in Mr. Beasley's cross between the red Highland cows and a roan Durham bull. The calves were white with red ears, a close approximation to the aboriginal cattle found in the Chillingham and Hamilton parks.

Every breeder who would retain the special features of a particular breed must thus at times reject particular animals, however pure their pedigree. And his mind must be ever open to the liability of his stock to breed back on an extensive scale when other breeds are resorted to for fresh blood. Unless some very desirable qualities are to be gained by the cross, the improvement in constitution and stamina will be better and more safely attained by breeding from members of the same family, whose characters have been modified by the effects of a different soil and climate.

9*th*. *Prepotency of races and individuals.*—And this caution in resorting to foreign blood is the more necessary that certain races and individuals have an inherent power of transmitting their own characters and fixing them permanently in their progeny to the exclusion of more desirable qualities in the breed crossed. Orton raised many chickens from a silk cock and bantam hens, but only three had silky feathers. Darwin bred from a silk hen and Spanish cock, but failed to get any fowls with silky feathers. In breeding Manx with domestic cats, seventeen out of twenty of the kittens had no tails. Among horses, Eclipse, King Herod and others have transmitted their own character to a very extraordinary degree. Among Durhams, Hubback, Favorite, &c., have virtually created the breed. But perhaps the most striking instance of the prepotency of qualities in one individual is that reported by Hirschmann, of the crossing of Merino sheep by a native German ram. The ram had but 5,500 fibres of wool on the square inch, the third or fourth cross with the Merino ($\frac{1}{8}$ or $\frac{1}{16}$ German) had but 8,000, the twentieth cross ($\frac{1}{1080576}$ German) had 27,000, whereas the pure Merino had 40,000 to 48,000. In other words, though there remained but one part of German blood in the million, the wool was not half restored to the true Merino type.

Violent crossing is thus seen to be beset with numerous pitfalls no less to be dreaded than those of the closest *in and in* breeding. But as this prepotency is especially marked in those breeds whose characteristics have been long fixed by a careful selection or an immemorial transmission, it can often be safely availed of for the amelioration of the races. The Durham bull which met his match, as regards force and fixity of type, in the ancient Highland cow, has much more potency of type than the less carefully selected breeds, and above all, than our nondescript native cows, and will transmit his own qualities to their offspring in greater proportion than he has shared in their procreation. The question is merely one of relative fixity of character, and while to the ignorant or unwary it may offer many pitfalls, to the intelligent and observent breeder it becomes an arm of power. Crossing a highly improved breed with an inferior one, with the view even of obtaining more vigor and stamina is a dangerous practice, but crossing a poor stock with a male of a select breed, with the view of raising the character of the first is a safe and remunerative proceeding. The progeny indeed, if afterwards bred among themselves, rarely maintain the excellences of the first cross, but if steadily put to thoroughbred animals, generation after generation, they will soon come up to the standard of that race.

10*th. Breeding in and in —Close breeding.*—To perpetuate and establish desirable qualities it is usually necessary to breed from close affinities. But one animal may be found possessing the property desired, and by pairing it with another, a certain percentage of the offspring will show the peculiarity to the desired extent. To these the original parent with the coveted possession must be put, and to their progeny, until the character has become sufficiently fixed.

To introduce new blood, however good in other respects, is to diminish the fixity of character. To breed in close affinities from these selected specimens is to intensify it. The advantages of such a system of breeding are patent to all, but the question arises, whether it has not also its serious drawbacks if followed too far? And I fear the answer must be that it has. I have known certain strains of Cotswold sheep and Durham cattle in which extreme excellence had been attained by close breeding, but only at the expense of a troublesome taint of consumption, and many of us can recall instances of deafness and web fingers or toes among the children of marriages between first cousins. Mr. Druce, a successful breeder of Oxford pigs, says: "Without a change of boars of a different tribe but of the same breed, constitution cannot be preserved." With the enfeebled constitution which results from persistent breeding from father and daughter, brother and sister, uncle and niece, there is also a concentration of whatever constitutional taint of disease may reside in the family. Lafosse mentions a breed of small black horses kept by a farmer in L'Aisne, and bred in and in. They were subject to specific ophthalmia, and soon the morbid taint became so concentrated that the whole family, with scarcely a single exception, was blind.

The doctrine that close breeding tends to sterility is supported among others by Sebright, Knight, Lucas, Nathusius, Youatt, Bates, Darwin, Magne, Macknight, Madden, Spooner, Wood and Carr. The wild white cattle of Chillingham Park, Northumberland, which have had no cross since the 12th century, "are bad breeders," the annual increase being but one to five. The equally ancient race in the Duke of Hamilton's park produce but one to six. Shorthorn cows, proving barren when put to a near relation, are often fertile with a bull of another breed, or even of a distant strain of their own.

Among sheep, Jonas Webb found it needful to maintain five separate families on his farm that he might introduce fresher blood of the same family into each at certain intervals.

But pigs have, above all, shown sterility from close breeding. Mr. Fisher Hobbes found it necessary to keep three separate families to maintain the constitution and fruitfulness of his *improved Essex breed.* Lord Western bred from an imported Neapolitan boar and sow until the family threatened to become extinct, and at once restored the fertility by a cross with an Essex boar. Mr. J. Wright bred from a boar and its daughter, grand-daughter and great-grand-daughter, and so on, through seven generations. The offspring in many instances failed to breed, in others they were mostly too weak to live, and those that did survive were unable to walk steadily or even to suck without assistance, The two last sows obtained in this way produced several litters of fine healthy pigs, though one of them at least had been previously served by her own sire without success. This sow was the best formed of the entire race, but there was no other pig in the litter. This case is remarkable, as showing a steady improvement in form and symmetry, advancing side by side with a steadily increasing weakness of the constitution, and of the mental and reproductive powers. Nathusius imported a pregnant Yorkshire sow and bred the progeny closely in and in for three generations, with the effect of seriously impairing the constitution and fertility. One of the last of the pure race, when bred to her own uncle, who was quite prolific with other breeds, had a litter of six, and on a second trial, one of five weakly pigs. He then had her served by an imported black English boar (which got litters of from seven to nine with his own breeds), and got a first litter of 21 and a second of 18.

The Sebright bantams closely bred were very barren, and this tendency in fowls is remarked by Wright, Clark, Eyton, Hewitt, Ballam, Tegetmeier and others.

But it will be observed that these evil results accrue from a persistent breeding from the very closest affinities. Experience has shown, in the case of our high-bred cattle and sheep, that constitution and fertility may be preserved without sacrificing the breed by introducing inferior blood. The true course, in case these evil results are threatened, is to select a male of the same general family, but which has been bred apart in a sub or branch family for several generations, and if attainable, from a different locality, climate and soil. Constitution and fecundity may thus be improved without even a temporary deterioration in other respects.

11*th. Disease and Accident.*—That disease, or changes the result of disease or of accident, are inherited among domestic animals, there cannot be the slightest doubt. Simple changes of structure from accidental causes are less frequently perpetuated than those giving rise to disease, and a transient disease is not likely to affect any of the progeny, but those in embryo at the time of its existence. Diseases with a constitutional taint, on the other hand, are transmitted from grandfather to grandson, though the intervening generation may have escaped.

As regards accidents and transient diseases, though the pitting of smallpox, the absence of limbs from amputation and the like, are not hereditary, yet the accidental loss of the tail in the dog, cat and horse, has determined an offspring void of tails, or with short ones. A cow which lost her horn, with suppuration, afterwards, had three calves hornless on the same side of the head (Prosper Lucas). A pregnant mare of Mr. Socrates Scott's, Dryden, N Y., had a severe inflammation of the left eye, supposed to have been caused by a burdock in the forelock. She remained blind till after the birth of a filly, and subsequently entirely recovered. The filly, now a nine year old mare, has the left eye undeveloped, represented by a small black mass about the size of a field bean, and quite opaque. The dam, after having recovered her sight, bore four colts with perfect eyes, and the mare with the undeveloped eye has equally given birth to several whose eyes were sound. Brown-Séquard found that Guinea pigs, in which he had produced epilepsy by an operation, afterwards brought forth litters subject to the same malady,—which is otherwise very rare in this species. Unusual as such cases are, they show the greater tendency to transmit a defect when accompanied by disease. Those diseases that are habitually transmitted are much more important.

The specific inflammation of the eyes in horses is notoriously hereditary. Its prevalence in England is much more limited than it was fifty years ago, when less care was taken by breeders to reject animals the subjects of this infirmity. In many parts of Ireland and America blindness seems to doom a mare to breed, mainly because she is less fit for anything else; and I regret to say that blindness is a remarkable feature of the Irish and American horses alike. Stop the stream at its fountain and in ten years the land would be stocked with a sounder eyed and more serviceable horse.

I knew a Clydesdale mare with feet preternaturally small, and kept tender by faulty shoeing, and of her four foals two had feet so small and weak that they were practically useless, while the remaining two, though born with well-formed feet, afterwards fell victims to founder and were ruined.

Bony growths on the limbs (splints, spavins, ringbones, sidebones) are so frequently hereditary that a rule may be laid down to that effect. This is often due to faulty conformation, as want of breadth, bulk and strength of the joints, upright pasterns causing jarring and concussion, or to faulty direction of the limbs and feet, natural or acquired, but in some cases it appears due to an inherent constitutional tendency to bone disease, rheumatic or otherwise. Rheumatism in cattle and sheep is notoriously hereditary, and it is to be regretted that the taint is shown in some of our very best families.

Heaves (broken wind) tends to be hereditary from want of chest capacity or a gluttonous appetite, as well as from a transmitted proclivity. Roaring is often hereditary from the badly set on head or want of breadth between the lower jaw as well as from a constitutional tendency. An instance is on record of a stallion which got sound stock, till he contracted *roaring* at ten years old, and nearly all his stock, got after this date, became roarers at the same age.

To recount all the maladies which may be transmitted would be to enumerate nearly all the diseases which flesh is heir to, but chief among these as most likely to be inherited, are those with a distinct though perhaps latent constitutional taint, and to this class belong rheumatism, consumption, scrofula, specific ophthalmia, and diseases of the bones and joints. It is rarely advisable to breed from any animal suffering at the time from any active disease, but those points would be valuable indeed which should persuade us to breed from an animal in whose person or family the tendency to any of the class of specific constitutional diseases named has been strongly manifested.

As to the mode of transmission it is perhaps idle to offer an opinion. We know that the germs of the future being, ovum and spermatozoa, have in them the elements capable of developing into elaborate organisms similar in nearly all points to their ancestors, and it is no more nor less difficult to conceive of the reproduction from these elements of size, shape, color, functional powers of secretion, nutrition, &c., than of the disease to which the ancestors were subject. Whether as Darwin supposes the original germs are composed of myriads of infinitesimal living particles, many of which may remain quiescent and inactive during one or two generations but be roused into activity and reproduce themselves in the third, or whether all the living germinal matter of germ and body is tainted with this hereditary malady, it boots little to inquire. That the germs contain it we know, and that it will reappear in the product of these germs or in his descendants we equally know. Knowing this we can safely strike at the root of the tree and prevent the development of the evil fruit.

RESPECTIVE INFLUENCE OF SIRE AND DAM ON THE PROGENY.

While all agree that both parents impress their respective characters on the progeny, much discussion has arisen with regard to the relative influence of the male and female on the young organism, and what parts and properties each most powerfully controlled. Whether the male wields the most potent influence, as the common practice of breeding from otherwise useless females might imply, may well be questioned. We have already seen that that parent, of either sex, which has the strongest constitution, enjoys the more vigorous health, and belongs to a breed whose characters are more permanently fixed, will exercise more influence over the progeny than the parent in which these characters are deficient or wanting. And the customary attention given to the selection of a sire usually secures these. But eliminate these and we shall see among our domestic animals, as we now see among the families of our friends, that the male parent must share pretty equally with the female one the credit of the family. The Arabs indeed, no mean judges if experience and success afford any criterion, esteem the qualities of the mare as much more important than those of the horse. Thoroughbred Arabian stallions are common, but whoever persuaded an Arab to sell his favorite mare? If we can obtain tolerable animals by selecting as one of the parents an animal of good quality and pedigree, how much better must they be if both are of this stamp.

As regards the parts whose formation is controlled by the different parents, the most generally received doctrine is that the male has the most potent influence on color, skin, hair, head, ears, neck and locomotive system generally, while the female tends to control the size, the internal organs and the constitution.

This idea seems to have been suggested to Buffon by the brown hair, short thin neck, quadruple udder, and long legs of his nine hybrids between the he-goat and ewe. Also to Flourens by the fur of his hybrids between the jackal and bitch. Richard Booth is said to have acted under this idea in producing his unsurpassed breed of Shorthorns. But Mr. Orton was the first to truly state the doctrine and defend it. He saw that the mule resembled the jackass his father, in his main external characters, but approaches the mare in size, stamina and energy; conversely, that the hinny is externally like its father the horse, but in size, sluggishness and want of vigor more closely allied to the donkey; that the cross between the hemione and she-ass at the *Jardin des Plantes* had the external characters of the male parent mainly, and that the crosses between certain breeds of fowls presented the same characters. The exceptions to the rule are neither few nor slight, yet results so frequently accord with it in the ordinary course of breeding, that we cannot, I think, afford to look on them as purely accidental. While withholding a full assent thus to the broad doctrines of Orton, I still think them sufficiently well founded to guard us against breeding from mare, cow or ewe, with an insufficient development, weakness or unhealthy taint affecting the internal organs; or from any male deficient in nervous energy and vigor, and above all, faulty or predisposed to disease in his locomotive organs. It does not follow that a female may be used with these latter failings, nor a male with the former. An animal of either sex is likely to transmit any fault it may possess, but failings of the nature I have indicated should be specially guarded against.

BREEDING OF MALES AS A SPECIALTY.

As we have seen, the male of a highly improved breed usually impresses the progeny in a higher ratio than the less improved female. The male too can more quickly cross a whole flock than the female, which can only yield two or three increase yearly. Hence the importance of raising males specially for breeding, and bringing them to the highest possible state of excellence. And wherever this plan is adopted we see the beneficial effect on the enhanced value of the progeny. Examples might be cited among thoroughbreds and trotters, Durhams, Jerseys, Ayrshires and Devons, but they are specially remarkable among sheep. The best Cotswold rams raised by Wells, Beale Browne and others, on their native hills, and the finest Leicesters will readily let at auction for the season for £20 to £40 per head. And the successful bidder finds his profit in paying these high prices rather than in perpetuating inferior qualities in his flock. He reaps his reward, as any one who will examine his flock and his yearly balance sheet will not fail to see.

REGULATING THE SEXES OF OFFSPRING.

Could such breeders of males succeed in obtaining male and female stock at will, their specialty might be made more satisfactory and remunerative. It is often equally desirable to secure a majority of females in the offspring. No wonder then that men's minds have been in all ages exercised with this question of regulating the sexes. Many rules have been laid down for this purpose, but the great majority are self-evidently absurd, while the remainder are but of very questionable value. I will mention a few of the most reasonable of these hypotheses:

1. The desires and ideas of the parents at the time of conception determine the sex.
2. The nature of the food of the parents, and particularly of the mother during pregnancy.
3. The manner in which the spermatic artery is given off from the aorta.
4. The male germ is supplied by the right testicle or ovary, and the female from the left.
5. The full age and greater strength and vigor in one parent, will secure its sex in the majority of the offspring.
6. The ovum impregnated just after the rupture of its ovarian vesicle will be a female, while that impregnated later in the lower part of the Fallopian tube will be a male.
7. The persistent selection of females, for breeding purposes, which yield one sex mainly, will finally obtain a race producing mainly males or mainly females.

Concerning the influence of the mother's wishes, we have some of us known instances of a strong conviction and desire on the part of the mother, during pregnancy, being fulfilled and verified in the birth of a son or daughter. But how often is the opposite also the case?

Girou de Buzareingues alleges that more females are born when the mothers are well nourished and left in repose than when worked and on spare diet. This question ought to be easily settled by some of our Shorthorn breeders, accustomed to the forcing system.

The supposed effect of the variable origin of the spermatic arteries and the alleged male and female characters of the right and left testicles are unworthy of serious remark. Even the authority of the father of medicine, and his curious instructions for binding up the right or left testicle according to the sex desired, will not overrule the fact that males and females with single testicles and ovaries are capable of producing both sexes.

Leroy, Girou and Colin agree that the more fully developed and vigorous the male as compared with the female, the more males will appear in the offspring, and conversely, that a strong female served by a weak male will have more female offspring. This they observed on dogs, but much more conclusively on sheep. The full-grown, strong and vigorous ewes with a young or weakly ram, brought forth a majority of females, and the union of a full-grown, robust ram, and old, weak or diseased ewes, yielded a preponderance of males. Hofacker says he has noticed the same thing in the human subject, and Saddler's "English Peerage" appears confirmatory of the theory. Burdach has observed a greater proportion of male progeny than female, from the most prolific women, but whether from weakness caused by child-bearing, may be open to question. Presuming the theory to have some basis in truth, it may serve to explain a predominance of female offspring among domesticated gregarious animals, as the females are better fed and have less exertion than their wild compeers, and the male may be presumed to be, in many cases, weakened during the breeding season, by excessive use.

Lastly, Professor Thury, of Geneva, upholds the doctrine that the ovum impregnated at an early and comparatively undeveloped stage becomes a female, whereas if more fully developed before impregnation, the product is a male. Huber's observation, that the queen bee lays first female eggs, then males, and lastly again females, he explains by the theory, the first eggs are not fully developed when laid and impregnated, that the second lot laid later have had more time to undergo full development, while the last laid are but partially developed on account of the comparatively exhausted condition of the oviduct. Under his instructions, George Cornaz, an intelligent agriculturist in Vaud, applied the principle to breeding cattle. He had twenty-two Swiss cows served by a Durham bull on the first signs of heat, and all brought forth heifers. He had six Swiss cows served in the last stages of heat, by the same bull, with the view of raising work oxen, and all produced bull-calves. He had an imported Durham cow served, the last day of heat, to obtain a pure successor to his valuable Durham bull, and his wishes were crowned with success. This looks like solid ground, but alas! subsequent experiments made by Coste and others, on cattle, rabbits, birds, frogs and fishes, have given uncertain and contradictory results. It is difficult to set aside altogether the results obtained by Cornaz, and, on the whole, there is probably some truth at the foundation of the theory, but even if so, it must be granted that modifying circumstances will often, if not usually, set aside the rule.

And lastly, the proposal to *breed in* and perpetuate the tendency to produce young of one sex only, though exceedingly plausible in what it offers, will probably prove still more worthless. I am not aware that the attempt has been made to perpetuate such a power in the lower animals, but my own observations on human families are altogether unfavorable to its success. One family of six daughters, all married and all prolific, had each about an equal number of sons and daughters: and another family of seven daughters and one son, have so far had families equally well balanced as regards the sexes.

SUMMARY OF GENERAL PRINCIPLES.

To recapitulate, we have seen :—

1. That a perfect development and a sound and vigorous health, constitutionally, and above all locally in the generative organs, are conditions of fertility.

2. That in the maintenance and improvement of a breed the truth that *like produces like*, that the reproductive germ, ovum or spermatozoon will stamp upon the animal developed

from it the characters of the parent organism, is the backbone of all success.

3. That we can in a great degree, at will, produce variations and improvements in breeds, as by an abundant feeding, a mild, salubrious climate, a rich, healthy soil, a moderate use, education, stimulation or selection of desirable qualities. A disuse or rejection of undesirable characters and properties, by soliciting the weight of imagination in our favor, by allowing the breeding animals to mix only with those of the stamp desired, by crossing less improved breeds systematically by males of a better race, by crossing animals faulty or deficient in some particular point with others in which this point is developed in excess.

4. That the herding together of pregnant high-class animals and low-bred ones, and above all attachments formed between the two races, is to be specially avoided, as occasionally affecting the progeny injuriously, and that strong mental impressions from a new or unusual condition of surrounding objects are to be equally avoided.

5. That if the valuable female is allowed to breed to an inferior male she cannot be relied upon to produce pure-bred animals for several succeeding pregnancies thereafter. Through a strong and retained mental impression, through an absorption into her system of living particles (germinal matter) from the fœtus, or through some influence during pregnancy on those ova then being most actively developed, the good or bad features of the first sire are perpetuated in the progeny of succeeding ones.

6. That all breeds show a tendency to *breed back* or produce an offspring bearing the marks of their less improved and comparatively valueless ancestors, so that individuals of this kind must be rejected from the best breeds if we would maintain their excellence.

7. That certain races and individuals have their characters more fixed, and will transmit and perpetuate them in greater proportion than others with which they may be crossed, so that if their qualities are desirable ones, they prove highly valuable in raising other stock to higher excellence. If undesirable, on the other hand, they will, as in the case of the coarse-woolled German ram, depreciate the value of any stock crossed for many

generations. That fixity of type, however, is above all a characteristic of those races which have been carefully selected and bred up to a certain standard for many generations, so that in our best, longest established and most esteemed breeds, we have a legacy of the most valuable kind left us by the successful breeders of the past, with which we may mould our inferior races almost at will.

8. That while breeding continuously from the nearest relations tends to a weakened constitution, the aggravation of any taint of disease in the blood and sterility, yet that these may be avoided by infusing at intervals fresh blood of the same family, but which has been bred apart from this branch of it for several generations. That, moreover, the highest excellence is sometimes only attainable by breeding very closely for a time.

9. That diseased or mutilated animals are generally to be discarded from breeding. That mutilations resulting in disease, that disease existing during pregnancy, and disease with a constitutional morbid taint, are above all to be dreaded as transmissible.

10. That there is some foundation for the opinion that the sire tends to contribute more to the locomotion and external organs, nerve and vigor, and the dam to the size and internal organs, so that if we cannot obtain the greatest excellence in both, we should, at least, seek to have each unexceptionable in the parts and qualities attributed to it.

11. That with regard to the controlling of the production of sexes, while the Creator has made them at first *male and female*, and will probably continue to do so irrespective of our meddling, yet there is reason to believe that certain conditions of the parents influence the sex of the progeny to a perceptible degree. If the feminine element in the progeny is increased by rendering the system of the mother more soft, lax, and adipose by high feeding and want of exercise, by the strength and vigor of the female as compared with the male, and perhaps even by having the females put to the male on the earliest symptoms of heat; and if the male element is increased by the greater strength and vigor of the sire as compared with the dam, and perhaps even by having the female served only as the heat is passing off, we need not despair of increasing at will the number of females or males in our stock, but ordinary

mortals must not expect the success which attended the efforts of Thury and Cornaz.

I could have wished to have gone into other phases of this subject, and especially into the qualities of the different breeds and races of animals, and the application of the principles of breeding to their perpetuation and improvement. But these will, perhaps, be treated to more advantage in the discussion which will follow. Perhaps there is no subject in connection with rural economy, which is more worthy of study on the part of the agriculturist than is breeding in all its phases and relations. Many of its conditions, it must be confessed, are as deeply hidden from our sight as is the secret of life itself, but some are already obvious enough, and with such results as are offered to us in our various improved breeds, we have the strongest possible stimulus to continued effort in this direction. An enthusiastic devotion toward carrying out the known principles on which the amelioration of breeds is based, and a zealous investigation with the view of elucidating more information on the functions of reproduction, cannot fail to bring a rich reward in the future as it has done in the past.

Mr. Goodman, of Lenox. *Mr. Chairman and Gentlemen,*— This subject is one which perhaps no unprofessional man can treat well, but I am always roused to the discussion of this subject, and particularly when I hear the words "cock-tail horse" or "cock-tail bull" uttered, because there is nothing that we who are engaged in breeding are compelled to fight so continually as the persistency of our brother farmers in using these "cock-tail bulls." We have in most of our societies eliminated them, cleaned them out; but every year the question is brought up, and we have to fight it over again. But we are in hopes that, this year, this Board or the legislature will fix it so that hereafter none of these "cock-tail bulls" shall be brought out for service, or, at any rate, for the premiums at our fairs.

But this subject of breeding is one that very few farmers understand; and this arises from deficient education. It is very difficult for any man of mature age, who has not been well grounded in science, to arrive at a nice appreciation of those distinctions which learned men make, or to understand and carry away with him much information from a lecture like this, replete as it has been with theories and facts. But I trust the time is coming when men will be educated among us, at our Agricultural College, who can stand up and explain to their brother farmers the principles of science, and inoculate us with the necessary learning of our profession.

And not only are farmers ignorant of the principles of breeding in connection with the brute creation, but this ignorance extends through the community, in reference to the whole question of reproduction, and every woman in the country is just as ignorant of the laws which govern the breeding of the nobler animal as we are of the laws which govern the breeding of our inferior animals; and this ignorance arises mainly from the false delicacy or mock modesty which pervades the men and women of the country. It was this feeling which prompted the clergyman, who announced last evening that a meeting of the Board would be held here to-day, to refrain from mentioning the subject for discussion.

Not long ago I went down to Connecticut to see some cattle. There had been an auction sale, and when I got to the place I saw a good-looking young lady and asked her, "Are the cattle all sold?" "Yes, sir; all sold but the gentleman." Said I, "I suppose you mean the bull?" "Yes," said she. It is time that our women should know that a bull is a bull, and a cow is a cow, and that all intermixture of them produces calves. In the course of a public address recently, I had occasion to explain the various stomachs of a cow, and a very intelligent lady, the wife of one of the best farmers in the place, expressed her thanks to me for the information I had conveyed in regard to the cow's stomachs, as she had always thought, she said, that the cow had but one stomach, like herself.

There is an old superstition, which has come down to us, that because woman partook of the apple, there was a curse put upon her sex, and that women would do wrong if they attempted to remove that curse. I do not understand that to be the true reading.

"In sorrow shalt thou bring forth," says the text, alluding to woman and her offspring. This sentence has resulted in a general belief that the pains of childbirth in their present aggravated intensity are unavoidable, and many good people suffer under the delusion that to attempt to alleviate such "sorrow" by preparing the system for the event would be flying in the face of the Creator. As the female who observes a suitable regimen will, *ceteris paribus*, always enjoy more tranquillity both of mind and body and incur much less risk of injury to herself and child than she who, giving a free rein to her appetite, indulges to excess in the use of improper articles of food, and as reasoning from analogy with the animal kingdom—the book of nature, the handwriting of God, bears on every page evidence of his wisdom and goodness—I am inclined to believe that this supposed curse was rather an inference of the sacred historian from what he witnessed, than a correct report of an actual sentence of the Almighty. The Rev. Joseph P. Thompson, D. D., LL. D., in answering his own inquiry, whence came the account of the creation but from God himself, "conjectures" "that what is given as narrative passed before the mind of the original narrator in a series of retrospective visions," and we wish to give women the benefit of this "conjecture," that they may learn that the functions of gestation and parturition are as natural as digestion, and should be attended with as little pain.

Is there any farmer here who would undertake to shut his cows up in the barn, girt them tightly round the waist, feed high, and expect them to have calves without pain? We know that we cannot get a cow safely through parturition unless we give her plenty of air, nutritious but plain diet, and all the exercise she needs. If we undertake to tie her up without exercise and feed her on rich grains, she is very likely to slink her calves, and have a great deal of trouble in dropping them.

I apprehend that the assembled wisdom of the legislature, who generally control this subject, and especially that class of them who consider that the farmer should not be educated, because if he is he won't do any work, may criticise our friend's remarks in relation to the breeding of the inferior animal, man, and contend that we ought to confine ourselves to the consideration of the superior animals, the ox, the cow and the horse. As to these subjects, it is almost impossible for any man here to continue the discussion, after the remarks that have been made by the lecturer; but we have had such a mass of facts given to us to-day that we cannot digest them all, and perhaps it may do us good to bring out one or two salient points.

In relation to this matter of breeding, it seems to me we have the control of the whole thing within ourselves. It seems to be an axiom, and. especially since this wonderful "*Novum Organum*" of Darwin,—this doctrine of the selection of species,—that we can, by a proper selection, produce just such results as we desire. There is no more noticeable instance of this than what took place in Massachusetts, on Charles River, in 1791, in relation to the "Ancon" or "Otter" sheep. We had, before that time, no good wool-bearing sheep. Our sheep were a short-bodied and long-legged animal; but that year one of the ewes of Mr. Seth Wright, who had a flock of fifteen ewes and a ram of the *ordinary kind*, presented him with a male lamb differing, for no assignable reason, from its parents by a proportionately long body and short, bandy legs. He was advised, by some man who had a little wit about him, to put that ram to his ewes, which he did, and the result was, that very soon he had a flock of short, crooked-legged sheep that couldn't jump fences, and that were the admiration of the country. That breed of animals remained here until the introduction of the Spanish merino, which was a so much better sheep, so far as the wool was concerned, that at last it died out. That shows the great power we have in the selection of our animals; and it shows that we have within ourselves, if we study this subject, the power of producing animals of just such type as we want.

But one great difficulty that has embarrassed most of us arises from a question which was one of the principal questions adverted to by the learned Professor; that is, the various influences of the male and the female. It has heretofore been laid down as an axiom, that the male always gave the locomotive or external parts of the system, and that the female gave almost entirely the vital organization. This has led us into a great many errors. The farmers of this State and elsewhere have been in the habit of selecting good bulls, but have not selected the proper females, relying entirely upon the male, so that we have not produced just such results as we desired. Now, my experience, and I apprehend the experience of a great many other breeders, is, that that rule is not the correct one; and I apprehend, also, that an examination of the authorities on that subject will show, as the Professor has shown us, that that is not the correct rule. So far as the Arab horse is concerned, an examination was entered into by certain French *savans* several years ago, and they came to opposite conclusions, some of them claiming the stallion as the most valuable for purposes of breeding, and others declaring that the influence of the mare predominates in the foal. Bakewell, the celebrated English sheep-breeder, always contended that the fine qualities of his sheep were owing to the female; he would sell or let his rams, but his ewes were sacred.

The result of my investigations is to this effect, that we cannot get a perfect animal unless we have a perfect female as well as a perfect male; and the reason why we get so much benefit from the connection of the Durham bull with our ordinary cows is, because the one is so much weaker, is a coarse animal, and the other so much stronger from its perfect purity of blood. The result is, that the grade Shorthorns of this country are always far superior to their dams in form, and superior to the animals that come from the connection of the common bull and cow.

I want to bring out this idea of the potency of blood very strongly, because of its bearing on the question of pedigree in animals, which so many are inclined to laugh at. What we call "pedigree" is only the history of the animal, showing his connections and his antecedents. There is no stronger illustration of this potency of blood than what took place when the effort was made to cross the Roussillon ram, a comparatively poor sort of animal, with the English breeds. The result was, that all the progeny of this mixture partook entirely of the characteristics of this ram, because of his entire purity of blood, whereas the English sheep were of a mixed race; and it was not until there was an alteration in the system, by the introduction of hybridization, that the attempt to intermix the two breeds was successful. This fact, among thousands of others, shows the great importance of preserving purity of blood, and the best blood in our cattle.

There is only one other remark which I desire to make in this connection, and that is, that we pay too little attention to the age of the bull. In this country, we breed from our youngest animals, and we get rid of them before they mature. In other countries, they do not use an animal for breeding purposes until he is comparatively mature, and they retain him as long as he is doing good service. It is the custom here to put our bulls to cows when they are a year old, and by the time they are three or four years old we get rid of them. The result is, we have a great deal of immature stock, and there is no doubt, as the Professor has stated, that a great many of the abortions, and many of the diseases to which our cattle are subject are owing to this fact. I apprehend, that if we would change our course in that respect, if we would wait until our bulls get a little older before putting them to the female, and if we would retain them after they get mature, we should have better stock. I think there is hardly a gentleman here who will not say, that the best calves he gets are from bulls that are six or seven years old, which have been properly fed and exercised; and I believe we can only keep up our stock, and breed a good class of animals, by using males that have become somewhat mature.

Hon. SIMON BROWN, of Concord. I desire merely to ask a question. In the summing up of the lecturer, I think in his fifth item, he states that when a cow of pure blood is put to a bull of mixed blood, there is danger that the progeny in after conceptions will take the form and features of the first animal. The question I desire to ask is this,—whether the semen of the male in the first conception does not pass into the circulation and remain there as long as the female conceives; and whether there is any certainty afterwards that you will get a pure animal from any other bull?

Professor LAW. The question is easily answered. It does not; otherwise, we should find in the circulation those elements. But the question as to whether certain minute infinitesimal elements pass into the circulation is one which we cannot answer. That is a question started by Darwin. He supposes that the minute living particles or germs, that are afterwards to be developed into cells, if you please, and to control the development of future beings, are really absorbed and remain in the blood, inactive, it may be for generations, passing through a number of individuals, and afterwards re-appearing and showing their type. Of course, we cannot trace these minute particles, many of them so small as to be perfectly inappreciable by the most powerful microscope.

Hon. CHARLES G. DAVIS, of Plymouth. I do not rise to attempt to give any information on this subject, but to confess my ignorance. My principal object is to ask a question, which I think is of great practical interest to us, both as breeders of, and dealers in cattle, and as persons intimately connected with the management of our agricultural societies.

The question is asked me every year (and I suppose it is asked most of those here), what, for all the practical purposes of dairy stock, more particularly, we should call a pure-bred animal? I suppose that the Professor is informed as to what is the proper rule on this subject. I took note of what he informed us in regard to the mixture of the Arabian and English breeds of horses, and also of the German sheep. But I was surprised to find, upon a visit to the Dublin Model School this summer, that Mr. Baldwin, the manager of that institution, who is one of her Majesty's commissioners of education for Ireland, laid down the rule, on the authority of the Royal Agricultural Society, as I understood him, that crossing to the sixth generation was considered pure blood, for all the purposes of an agricultural show. He may have said the fourth, but his statement certainly was not anything beyond the sixth.

Now, as I have said, we all hear that question raised, as breeders or as managers of agricultural shows, and I, for one, would like to be informed whether, if an animal is exhibited at a show with all the marks of the breed which it purports to represent, and is excellent in those qualities, we should consider it pure blood or not, if it is an animal of the sixth, seventh or eighth degree.

Of course, I understand that such an animal is not, mathematically speaking, of pure blood; I do not claim that it is; but I want to know where the impurity ends and where the purity begins, for practical purposes, or whether it begins or not, and what should be our rule, as practical men on that subject.

The CHAIRMAN. So far as we are concerned, practically, as farmers, the rule is a very simple one. We know, practically, that the farmers in other countries have established certain recognized breeds of cattle and horses. There is no question about that. They are produced ready to our hands. All we have got to do is to provide ourselves with them. We have not established any breed here in America. We have secured certain local breeds, confined sometimes to a town or county, often to a farm; that we all know who are in the habit of observing the cattle of this country. But we have not devoted ourselves to the establishment of any specific breed of cattle or horses or sheep, except an improvement of the Spanish merino. We have cattle and horses adapted to our specific purposes. We can, however, go abroad and find the different families, so that, practically, it would seem to be a sufficient rule for us, to trace our animals back to a given imported animal, which started from a good foundation. Everybody knows that the rule for an English thoroughbred horse is, that the dam shall have been bred straight for thirteen generations. What the rule is for cattle Professor Law can state better than I can.

Mr. Davis. My question did not relate to the establishment of breeds, but to what we shall regard as pure breeds in milch stock and cattle.

Professor Law. I feel altogether incompetent to answer the question. In the case of the English thoroughbred, you have heard what is estimated as really coming up to the standard of a thoroughbred horse. In the case of cattle, the Royal Agricultural Society of England have, no doubt, found good reason to adopt the rule which has just been stated. But my impression is this: that we should find the results very different in the case of different animals,—the cow, the horse, the sheep, the pig,—and even in regard to different families of those animals. Crossing with a nondescript animal, we get quit, in four or six generations, of almost all traces of the original inferior strain. By crossing with an animal possessing some marked physical traits, we would by no means get quit of them so readily. So what would apply to one would not apply to all. We saw the extreme tenacity of this German ram upon the French merinos, in deteriorating the wool through twenty generations—deteriorating it by more than one half; and I have no doubt that you want a careful observation as regards the effects of a continued crossing of different breeds, in order to establish a series of rules, rather than one fixed rule to go upon in these cases.

The President, Dr. Loring. Professor Law has brought us back to the statement I made, that whenever there is a recognized breed of cattle, we should endeavor to start from that point, and stick to it in our offers of premiums in our agricultural societies. I can conceive of no other way. There is a recognized breed of cattle known as Shorthorns, and you may twist and turn it, and try to get around it any way you please, but you must finally go back and start with "Hubback," and come right along down with him. You cannot evade it; and why there should be any local opposition set up to the Shorthorn, I do not know. We all know for a hundred years, the Scotch farmers have been at work to produce the best dairy cow, in which the vascular system is better developed than in any other animal in the world, and they have established that. Why should we say, "We will go to work and get up a breed of Ayrshires here?" We have got a cow that has got along so far, we have got a good animal to start from, and why not stay there? For a hundred years, and I don't know but five hundred, the farmers of the island of Jersey have been devoting themselves to the production of an animal suitable to their specific purposes, known the world over—the Jersey cow—famous for the production of milk, so filled with oleaginous matter that there is probably no better milking animal in the world. If any man has an animal that he can trace back to the island of Jersey, that is enough. Why go wandering over the mountains and through the valleys of New Hampshire and Vermont to find out if there is any way of getting round the rule. We have found the road, let us stick to it, and we can go on improving our animals to the credit of ourselves and our societies.

I often hear the phrase "a thoroughbred horse." There is no such thing as a thoroughbred horse in this country. The word is applied especially to that class of horses, bred by Englishmen for generations from "Godolphin Arabian," and some other Arabian horses introduced into the studs of England. The American trotting horse contains an infusion of all known bloods, just exactly as the thoroughbred Yankee does. After having filled his veins with the fire of a thoroughbred horse, direct from Arabia if you like, and after having got rid of the odious knee action of the thoroughbred horse, you want a little infusion of Canadian blood, to bring down his fore feet and open his hind quarters in order that he may get along as a trotter. Then he is given a chance to develop himself in just that pasture land and that clover that will make, as the Professor told us, a good horse—high dry lands, where their nerves, muscles, tendons and sinews will all grow strong. In that way we have got a trotting horse in America, which I insist upon it (and a great many English gentlemen agree with me) is the best horse for the American farmer there is on the face of the globe.

I have got sick and tired of hearing about "thoroughbred horses." A thoroughbred horse is a good horse, that is all. You may talk of "Rysdick's Hambletonian" and the rest, as much as you like, but the moment you get away from the sire, the dam is in a fog; you don't know what she is. My word for it, that the great power of an American trotting horse consists in this fact: that with the best English blood there has flowed down into him, from the Canadian French horses, that little strain of blood that has given our animals that knee action and propelling power in the hind quarters which charaterize the mass of trotters all along the northern line of the United States. That is the American trotting horse. I don't think there is any rule to lay down about him, except that he is a Yankee horse.

I have tried to answer the question as well as I can. Start from a recognized breed, and let your societies stick and hang to that. If any man comes in and says that he has got a bull whose dam was not exactly pure, ask him if he will be kind enough to go and get a bull whose dam is exactly pure. That is the end of it. We have tried to get round it, gentlemen, but the additional expense is only about fifty dollars, and it is fifty dollars well invested.

Now, I desire to say a word or two to confirm what Professor Law said this morning. You will excuse me, because this has been a favorite subject with me, and some ten years ago I occupied more than fifty pages of one of Mr. Flint's excellent reports with an essay upon it. Not one single proposition which I stated then, I am glad to know, has ever been disputed or refuted by any scientific gentleman who has appeared before you. You have heard, time after time, Professor Agassiz confirm what I then said, and, to-day, in the most elaborate and comprehensive lecture by Professor Law, who has been thoroughly educated in the English schools, he has confirmed every position I took. One or two things which he said will bear repeating. In the first place, in regard to the use of immature animals. How much we have said about that discarded and outlawed animal, the bull, in New England,—the *runt* of the farm! How he has been decried and abused, because we thought that all we needed was the cheapest male to be found for the reproduction of the species.

I am not at all surprised, nor are you, that under such management, our markets have been filled with inefficient animals. Neither am I surprised, in view of such treatment of our male animals as that, that we have been compelled to go elsewhere and bring in matured bulls for the production of suitable animals for our farms. It is an insult to the animal economy to call upon a male or female to transact that business for which he or she was intended by nature, until the faculties are all in full force. That is true in regard to the animal kingdom everywhere. So you find that cattle always deteriorate under the use of young bulls, and also, I think, under the use of too young females. No horse has ever distinguished himself as a stock-getter until he was mature. More time is wasted in using young stallions than almost anything else. A horse is a bundle of muscles, bones and fibres, intended for strength alone, and he can never transmit them until he has reached his perfection; and so, in England, " King Herod " and " Eclipse," and in this country, old " Black Hawk," " Ethan Allen," " Rysdick's Hambletonian," and all the distinguished stock horses we have ever had, never did their best work until they had reached the maturity of life. This is a most remarkable fact, and history shows it to be true in regard to all of them. I was glad to hear Mr. Goodman insist upon that point, which was presented by Professor Law, in regard to the use of immature animals.

Then in regard to the adaptation of animals to particular localities. If you do not do it yourself, nature will. You cannot raise Shorthorns upon the dry pastures of Plymouth and Essex. If you put them there they will become something else in the course of time. It is wiser to go to work and put the proper animals there to begin with. It is an invariable rule, which cannot be violated with impunity. " You cannot raise grapes from thorns, nor figs from thistles," any more than in the olden time.

Now in regard to the influences exerted upon animals. Don't you know how I insisted upon it four or five years ago, that no man could have two breeds of cattle on his farm at the same time, and expect that he could breed one of them; and Prof. Agassiz rose and said that he had seen that fully illustrated over and over again in his own native land of Switzerland. But if you go on some farms, you will find two or three Shorthorns, and here and there a Jersey, and a few Ayrshires mixed in, and perhaps a Galway, and what not; and the owner expects to take care of them all, but he won't do it. Somehow or other the influence of association upon the animal economy is almost as great as it is upon our moral natures. "Evil communications corrupt good manners." It is just as true in the brute creation as it is in society. So the farmer should select the breed adapted to his location and the character of his farm, confine himself to that breed, and treat his animals as if he believed that not only external influences, but his own conduct would have an influence upon them. And it is a great thing, too. The quiet, amiable man in the stable produces a very different effect from the noisy, unreasonable, violent man. I have no patience with noise and abuse in your barns and stables. Man can stand them, woman can, and have to, I am sorry to say, but cows cannot.

There are several other points which might be referred to in connection with this subject, but there is one point on which I desire to say a few words, because I do not know that it has been dealt with in any of our meetings. I noticed last night the delicacy that was manifested by the gentleman who announced the topic for discussion to-day, or rather did not announce it—and it has been mentioned here. I do not know that he was not right. I know precisely the feeling of elevation and independence and wisdom and good sense that actuated the remarks of Mr. Goodman, and I am not sure that I do not agree with him entirely. But, after all, you cannot introduce into the human economy and into the family of man the same rules that you do into the economy of the animals on your farm. It is of no use to talk about it, you cannot do it. You may say this is a misfortune, but it is not. Why, my friends, do you know that when Professor Law told you that locality influenced to a very considerable extent, not only the physical but the moral condition of animals, and that they changed entirely, I turned upon this audience and saw a race of beings who defy all latitudes, all climates, all influences, and retain their condition unchanged wherever they may be. Man is the only defiant animal on the face of this earth. You may put him at the north pole or the south pole. take him from here and put him under the equator, transport him into the most miasmatic marshes on the face of this earth, he is a man still; you cannot break him down, neither to any considerable extent can you change his conformation, somewhat by races you can, not always by locality. God has planted certain races to dwell here upon the face of the earth, adapted to the localities in which they live, it is true; but there is no locality which man cannot defy and in which he cannot retain his natural condition.

Now, my friends, standing here as a representative of this triumphant race, I am perfectly free to bury the whole question of human reproduction beneath our innate modesty; beneath those affections which bind us to each other, to our wives, to our sweethearts, to our daughters, in a way entirely unknown to any other representative of the animal kingdom on the face of this great globe. I am willing to acquiesce in it; I am ready to recognize the fact, that between us and our mates differences exist, and superior influences, to which we all are obedient, and in obedience to which we recognize the great law which in the beginning made them male and female, and gave every man but one wife.

It is on this ground that I have always been a little sensitive with regard to exposing those questions with which we deal by ourselves to our friends of the other sex. I don't know but I have been a little too sensitive. I do not find any fault at all. In fact, I am willing that every man should travel his own track. I find no fault with those who differ from me, but still, I do insist upon it, that we have a right to recognize the fact, that we do stand in a superior scale in the whole animal kingdom, and we have a right to be controlled by our finest sensibilities, by our highest moral natures, and by our most heavenly affections, in our treatment of this whole matter. You who heard the lecture last night, know how eloquently the distinguished gentleman dwelt upon those feelings which brought the distinguished poet, Robert Burns, and his little friend who was reaping with him the harvest over in Scotland together, so that their hearts became one. You know well what I mean by what I say. I ask you if any man in this room, having a manly boy coming forward in life ever regretted for one single moment that the woman upon whom that boy's affections were becoming fixed, who was having a good influence upon him, and keeping him out of difficulty and danger,—I say, did any father ever regret, before the magnetism of all those great moral influences which he saw going on, that that woman was not, physically, adapted to that boy? I do not believe there is a father here who ever thought of such a thing. You cannot think of it, my friends. You may sometimes, as you go on in life, wish it had been a little otherwise, but when you are going down the valley, and come to that point to which Mr. Collyer referred last night, where the sweetness and tenderness between man and wife are superior to the affection between lovers when they began to climb the hill, then you lose all regard for those animal laws which you lay down for your stables and your farms, and you recognize once more the superiority of man in the great scale of being.

Gentlemen, I beg you to excuse me for making these remarks, but I thought this was a proper place to put them in. I have presented them to you because I wanted you to be encouraged. Do not for one moment think that the race is dying out through modesty or misplaced affection. It is not. You cannot kill it.

Mr. GOODMAN. I want to say one word, because this is a question vital to our race. The point I want to bring out is this: that while our pulpits are complaining of the secret wickedness that is going on by abortions, arising in great measure from the dread, on the part of women, of the suffering attendant upon parturition, I think it is important that, if possible, they should be instructed what to do to prevent the pangs and pains they suffer at that time. Our houses are flooded now with the advertisements of men and women who profess to prevent the getting of children; who undertake to allow married women to live in licentiousness, by furnishing the means to destroy their offspring before birth, and thus hide their guilt from public view. I say that one of the great incitements to this gross wickedness is the great suffering which women undergo in childbirth; and I apprehend that it can be demonstrated that by proper diet, exercise and care, our women can be relieved of a great deal of this suffering, as animals can.

The Professor has shown us to-day that the young of animals can be so acted upon in the uterus, by proper food and exercise, that they can be produced with half the pain that would otherwise attend their birth, and I apprehend that the same thing is true of the child in the womb of its mother. Now, sir, if that knowledge can be conveyed to women and to fathers by a proper course of instruction in the principles of breeding, it seems to me there is no more useful information that can be given to us, either as farmers or citizens. However much I may agree with the doctor in what he has said in reference to the sentimental feelings between the sexes, I maintain that every married woman in the community should understand the principles of breeding, and learn how to produce, with as little pain as possible, living children, that shall grow up healthy men and women.

Mr. Brown, of Framingham. The question, as I understand it is this: Can I take a Jersey bull, which I can buy for a small price, and put him to my scrub cow, and from a series of conceptions can I get a Jersey calf? That is the point.

The President. You hear the question. For one, I don't know how long Mr. Brown expects to live. (Laughter.)

Mr. Davis. I thank Mr. Brown for recurring to my question. It is a practical one. I do not care to go into the matter, but I think the question of Mr. Brown was not put by way of a joke. What most of us, perhaps, want to know is this. Here is an animal presented for sale or for premium. It has been bred to the fifth generation, and there is not a man in this hall who can see the difference between a yearling, after the third generation, and what we acknowledge to be a pure Jersey heifer. In nine cases out of ten, we cannot see it in the third generation, and certainly no man can see it when it is the fifteenth or sixteenth generation. I never have found anybody who could. Now, you bring it down to thirty-one thirty-seconds or sixty-three sixty-fourths, and what does the difference amount to? It seems to me this is a question of practical importance. It is a question of importance to every one of us who attends our cattle shows; it is a question of importance to us in our dealings as farmers, whether we should consider that stock, for all practical purposes, as pure blood.

I agree with what the Chairman said with regard to the Anglo-Saxon race and its admixtures, but, unfortunately, it is entirely inconsistent with that part of his argument in which he declared that we had a pure breed, and that we should adhere to this, and nothing else. He seems to be unfortunate in his argument. You say that an animal that comes here from Ayrshire is an Ayrshire cow, the Ayrshire breed, and that it is better, as I have no doubt it is, to keep it entirely pure. I also agree that it is better, if you want to establish a breed in this country, to begin with one partly or wholly bred, just as it is, if you want to get up a pair of stairs, to begin half way up, if you can get there. That is the reason we use a pure-blooded bull with any stock. But we assume, all of us,—those who are the greatest sticklers for what is called pure blood, and breeding over and over,—that everything that comes from pure stock is pure blood. Now, sir, you know, and Professor Law knows, that in Ayrshires there is more diversity in color, in shape, and in almost every quality, except perhaps in the general milking quality of the animal, than there is in any other animal. You hardly see two animals alike. You find them of all colors under the sun; and at the exhibition of the Scottish Agricultural Society, which I attended, at Dumfries,—almost within sight of the tomb of Burns, and the thistles growing about his grave,—there were yellow and white animals, understood to be recognized by the judges as pure Ayrshire cows. There were other animals, that were nearly or entirely pure Devons, almost wholly a dark mahogany red. There were some animals—a very few—that had the famous "strawberry mark," which we talked so much about in this country a few years ago, and which Mr. Howard told us was the best animal; but there was no sort of regard paid to color, and there was no uniformity of shape. Any animal that is brought here from Ayrshire is recognized as an Ayrshire pure blood, without any question; but I have no doubt that many of those animals have had a mixture, within the last six or eight generations, of something that would not be called pure blood in Ayrshire. Nevertheless, we take it here and recognize it as Ayrshire. The question I ask is, whether we should do, in regard to Jersey stock, as Mr. Brown suggests.

Mr. Goodman. With regard to Shorthorns there is but one rule—we trace them to the herd-book. We go back a hundred years in the English and American herd-books, and any man who cannot trace his animal to either of these books has to be thrown out. With regard to Jersey stock, they are of more recent introduction, but the breeders are coming to the conclusion that the same course is the only safe one, because there is no stock where the grades so nearly resemble the pure bloods as the Jerseys. You will find that the grade, on the second cross, is as like the dam as possible; the best breeders cannot distinguish them. The difficulty has been found to be so great, that an association of breeders of that stock has been formed who are now getting up a herd-book. The rule they lay down is, that you must trace both sire and dam back to the importation. That is the only rule they can lay down; and when they get there they are pretty safe, because no other animal is bred on the island; all other animals are excluded by law, and they exclude from the breeding class there any animal inferior as a breeder, whether male or female.

Mr. Davis has referred to the difference in form and color of the Ayrshires. That difficulty is one hard to surmount, because, although our herd-book has been established, and the rule laid down that the animal shall go back to the importation, in the old country they have no herd-books of Ayrshires, as they have of Jerseys and Shorthorns, and the consequence is, we get animals of an inferior breed, because we have too great a diversity in those imported. But the only way is to make up a herd-book, get the best animals we can, and trust to that as the record of those animals; because it is too late, when we have here herds of Ayrshires, Shorthorns, Jerseys and Dutch cattle, to undertake to raise up another breed of animals in this country. It would take two hundred years to do it; and then all these diversities and variations have got to come out, and the result would be, we should have a mongrel breed which we could not rely upon. We have good specimens of animals—there are none better—and if we stick to them, we shall have good stock. The rule is, to exclude every Shorthorn that cannot be traced back to the herd-books. Next year the same rule will be applied to the Jerseys, and very soon the same rule must be applied to Ayrshires, if the breeders make up a herd-book.

Mr. Davis. I have accomplished my object, which was simply to get some answer that might go upon our records and be published, and to which we could appeal at our exhibitions. I am a pure-blood breeder myself. My object simply was to get a definite answer of some kind.

The PRESIDENT. The chair regrets very much indeed that when he stated distinctly, and somewhat elaborately, that he knew of no first-class animal of the various breeds, that could not trace its pedigree back to some importation, he was not understood. And when he replied to Mr. Brown, he did not intend to meet his question by a jest, but simply to state what the difficulty was. Mr. Brown asked how many generations he must breed a common cow with a Jersey bull before he could get a pure-bred Jersey calf; and my answer was, I did not believe he would live long enough to do it. I don't; and he may live to be ninety-nine years old. I think the answer is very definite.

Now, I want to ask Professor Law one question. There is no doubt that in all sciences, definite and specific names are of great value—nomenclature. There are American and English Shorthorn herd-books, and I have had the impression that the old name of "Durham" had been translated into "Shorthorn." Now, I find that in Professor Law's lecture this morning, he used the name "Shorthorn" and "Durham" as applicable to the same breed of animals; and what I wish to ask is, whether among breeders these two names are used interchangeably; whether, for instance, the herd which Mr. Thorne formerly owned would be called indiscriminately, by breeders, a "Shorthorn" or a "Durham" herd?

Professor LAW. That is the state of the case. The words are used, to a considerable extent in England, interchangeably. On the Continent of Europe, in my experience, the term "Durham" alone is used, or very nearly alone.

Mr. J. F. C. HYDE. There is one question I would like to ask,—whether the professor has ever investigated the question how to determine the sex of the progeny, and, if so, what has been the result of his investigation? I hear dealers complain that all their heifers are bulls. Can they make the bulls heifers?

Professor LAW. I had prepared some remarks on that subject, but the time had so far gone that I skipped them.

The CHAIRMAN. Do you prove anything by them?

Professor LAW. Very little. It would appear that, under some circumstances, a soft condition of the system of the female, from soft diet, want of exercise, and the like, predisposes to the production of females; and also, that the parent which was in the most vigorous and perfect health at the time of connection between the sexes, is likely to produce the greater number of animals of its own sex.

Then there are the experiments of Professor Thury of Geneva, which, I must say, have been pretty thoroughly disposed of, but which were carried on with some remarkable results in Switzerland, upon cattle. He got the manager of a farm (Cornaz) to undertake the breeding of the sexes at will, on this theory, that the ovum which was fertilized in the early stages of rut would produce a female, and that when it was fertilized lower down the Fallopian tubes it would produce a male. The results obtained by Cornaz were very remarkable indeed. The report gives an account of between twenty and thirty experiments. He crossed his Swiss cattle with a Shorthorn bull, with a view to obtain females for his dairy, and he produced females in every case by putting the bulls to the cows on the first appearance of heat. He next undertook to produce a certain number of oxen for work, and he put the bull to half a dozen of his cows towards the close of the period of heat, and he produced in every case males. He imported a Shorthorn or Durham cow, and wishing to replace his valuable bull by another of the same breed. he had her served at the conclusion of the period of heat, and she produced a bull-calf. In every case, so far as the report goes, he succeeded, but a number of other experiments upon other animals have failed. Whether it was luck, or whether there is something in the theory, I do not know. I am inclined to think there is something in it, but that there are so many counteracting influences that one can rarely attain to anything like the success that he attained.

Professor Verrill of Yale College, makes a suggestion which is worthy of attention, and that is, in regard to breeding from animals that show a tendency to beget only progeny of a particular sex. Get a female for example, which is found to breed mainly females, and take up her progeny, and endeavor to fix that trait in the breed, if possible. That certainly promises something. At the same time, I confess that my own experience in families of human beings is not at all uniform. I can recall two or three families that had only one male child among seven or eight females, and yet the females of those families have girls and boys in about equal proportions.

Mr. SURTEVANT of South Framingham. I will narrate one item of experience in regard to Jersey bulls. It is well known that Jersey bulls are very apt to get bull-calves. In two instances, I have had three bull-calves to one heifer calf. When the bull was a year old, I put him to three or four heifers or cows, and those were all he went to that season. He got all heifer calves the first year, and after that down to his fifth year three-quarters were bull-calves.

Mr. WARD. I suppose that in a state of nature, the cows are served in the early stages of heat; and yet we know that they produce about an equal number of males and females.

Mr. GOODMAN. There is a question in regard to breeding early. There is a great difference in the breed of animals in this respect. For instance, a Jersey heifer will take the bull when four or five months old, and come in at thirteen months; therefore, those who breed Jersey cattle generally put them to the bull quite early and have them come in early. Shorthorns are brought in early, in order to develop their milking qualities, and then allowed to go barren for a year.

Dr. PEIRCE of Edgartown. The lecturer has stated that abortion is frequently the cause of sterility. I would like to ask if the lecturer or any other gentleman can tell us what is the cause of abortions, or suggest a remedy.

Professor LAW. I presume that abortions are not to be attributed to any single specific cause. A great number of causes probably contribute to produce these abortions, and when once they occur in a herd, the extreme sensibility to odors which cows manifest, and the sympathy with each other, lead oftentimes a majority of the pregnant animals to abort, merely because they have seen others abort, not because of any special cause in themselves, other than this. We are very well acquainted with many causes of abortion, such as injuries, living and sleeping on marshy ground, any disturbance of the digestive or urinary organs, and above all, blows on the abdomen. In connection with this disturbance of the urinary organs, I will ask for some information. In those parts of New York where abortions most prevail, I find we have very hard water. The subsoil is limestone, and the water is very strongly impregnated with lime.

In the kidneys of animals taken from such places, I have invariably found minute calculi, which may contribute in many cases to irritate the generative organs and cause the womb to throw off its product. But the question I wish to ask is this: whether in those parts of this State where abortion most prevails, the subsoil is calcareous, or whether the water is or is not very hard.

There are, of course, many other causes. If the generative organs are disposed to be weak, it may be from too early breeding through a long series of generations, or the brain is more particularly disposed to disease, all the animals produced will show the effect in one or the other organ, in the one case by abortion, in the other case by paralysis or disease of the brain. It is probable that smut in wheat or corn acts in some way upon the womb. There is a record of nearly all the cows in Brazil having aborted in consequence of eating corn affected with smut. In Halle, Germany, a veterinary surgeon has found that he could produce abortion at will, in apparently healthy stock, by placing one animal where it would smell the abortion discharges of another. Whether it was from the smell of those discharges, to which the cow is so sensitive, or from some other cause remains to be seen.

Mr. HUBBARD of Brimfield. I have heard various theories stated in regard to the cause of abortion in animals. One gentleman, who was formerly a member of the Board, and who was in the State-house last winter, was very confident that he had discovered the precise cause; he was very sure that it was transmitted from the bull to the cows. I have never suffered from this cause until this year, but this year one-fourth part of my cows have lost their calves. The bull that has served my cows has served several other herds in my vicinity, and I do not know of a single cow, except in my own herd, that has lost her calf. There was a herd about a mile from mine that a few years since had the same difficulty, one-half of the cows, perhaps, losing their calves. Since that time, I have not heard of a single case in that herd.

It has been stated that this trouble was owing to the use of too young a bull. This year, the bull that served my cows was not a young one. I do not know of any cause. All these abortions occurred previous to the winter months; the first was in the latter part of September, and they continued along until within three or four weeks. No animal has got to the herd, so far as I know, and they all seemed to be in a perfectly healthy state before the abortions and immediately after. I have gone right on with the cows that were in milk, and they appear to be in just as healthy a state as any cows in my barn. Perhaps another year the same difficulty will occur in another herd, without any apparent cause, and I shall be entirely free from it. In Hardwick and Barre, the same season, without any apparent cause, from one-half to three-quarters of the cows lost their calves. Perhaps another year they will lose none.

If we can discover a remedy for this, we shall confer upon the farming community something that will be of great value to them.

In my case, the difficulty could not have been caused by smutty corn, for the corn was all gathered from the fields over which they roamed, and they went over the same fields over which they have gone in years past. They had, to all appearance, the same feed. I have no limestone water. The water the cows get is soft water. I know of no cause whatever, and I know of no one who has been able to give any explanation that is satisfactory on this subject.

Mr. FAY of Southborough. In one word I will relate my experience in regard to abortion in cows. Some twenty-five years ago, I had a stock of thirty cows, and eighteen lost their calves, commencing not far from the first of November, and continuing until about the first of March. I wrote to different individuals in regard to it, but I could learn nothing satisfactory. I got from the different individuals different opinions. I took the pains to separate the cows that lost their calves from the others, as far as I could, but I found no benefit from it. I bought six cows in the fall, from Vermont. Those six cows were put into stalls near the others, and not one of them lost her calf, although cows right by the side of some of them lost their calves. I was convinced that there was nothing in sympathy. If there was, why did not those six cows lose their calves ?

I believe I kept fourteen out of those eighteen cows. My neighbors told me it was no use to keep them ; that they would lose their calves the next season just the same. But I did not lose one the next season by abortion, and I did not lose more than one or two during the next twenty years from that cause. In the town of Westborough, above me, some years one-third of the stock have produced abortions. If anything can be found to prevent it, it will be one of the greatest boons we have discovered yet.

Mr. GOODMAN. We think, up our way, that feeding wheat bran prevents it. Mr. Bucklin can state some facts in regard to the matter.

Mr. BUCKLIN of Adams. I have had a good many cases of abortion in my stock. The first case occurred in 1864. We had only two or three cases that year. The next season, with a stock of about forty, we had eighteen. We were using at that time, as was customary with the farmers in our neighborhood, what is called a "cock-tail bull" or "scrub bull,"—young bulls usually. We were not feeding our stock with anything except hay. The next season after that, which was 1866, we had thirteen cases. I then purchased a thoroughbred Ayrshire bull, which was three years old, and have used a thoroughbred bull ever since, and have fed wheat bran to a considerable extent; using coarse wheat bran through the summer quite extensively, never milking a cow without feeding her two or three quarts of wheat bran, and we have had no case of abortion for the last four years. There have been a great many abortions in our town, and farmers who do not feed wheat bran have had a great many cases this fall.

The CHAIRMAN. Do you feed the bran dry or wet?

Mr. BUCKLIN. Part of it I wet with whey, the other part I feed dry. I have no limestone in my vicinity, and the cattle have soft water invariably.

Mr. NOURSE of Westborough. In Westborough and vicinity, and in Grafton, the farmers who have suffered most severely are those who have fed the most wheat bran. In a stock of twenty-two or twenty-three cows, within a year and a half, I have lost eighteen calves, and I never fed more shorts than I have during the last year or year and a half. I have fed six quarts a day, perhaps, and some of my friends have told me, "If you will stop feeding your cows so high, you will find they will come round as usual." A friend of mine who has lost thirty calves from the same cause during the last year and a half, is also one who has fed as much shorts as any man I know.

The Chairman. I think the reply made by Professor Law to the question put by Mr. Hyde, whether he knew of any cause or could suggest any remedy, should be remembered. Professor Law said there was no one cause, and no one remedy. That is the key that will unlock the whole thing. By starting with the theory that there is but one cause and one remedy, we never shall arrive at any satisfactory conclusion. The causes are and must be various. A sudden change of food, for instance, a sudden change from a poor quality of hay to a good quality of hay, may be one cause. In Mr. Hubbard's case, he said his cattle had the same grass the year they lost their calves that they had had before. He did not put that grass to the test of the chemist and the microscopist, and he cannot tell whether there was or was not some disease in that grass which produced the effect of which he speaks.

This is one of the most intricate and difficult problems that we have to settle. We are sure of one thing: that general good care, as uniform feeding as possible, and great care in the curing and storing of hay on which they are fed, are essential. That is as much as we can do for them. The influence of smutty wheat—of smutty grass seed—of the various fungi that will gather upon the stalks of grasses and elsewhere, which possess the same properties that ergot does in rye and wheat,—of sudden blows,—of the sympathy which exists in a herd to which Professor Law alluded,—all these causes are before us, they are all to be investigated, and all to be avoided in the best way we can. And when as an epedemic it strikes our herds, we have either got to be as patient as Mr. Fay was, believing it will pass away the next season, or else we must get rid of our herds, and start again.

Mr. Goodman. What is the effect of feeding twice a day?

The Chairman. I cannot answer that question. All I know about the effects of feeding twice a day accords with the effects of what is usually called the Barre rule. The fact is, that animals are kept in as good health by feeding twice a day as in any other way. I have never been able to produce as much good health or as much fat and flesh, as by the Barre mode of feeding. Cattle will not eat quite as much when fed twice a day as when fed three times. Let them feed two or three hours, then rest three or four hours, then feed again two or three hours, and repose until the next day. I am ready to back up Mr. Ellsworth in that, through thick and thin, for I have tried all modes of feeding, and that is the mode that suits me best.

Adjourned to two o'clock, P. M.

Afternoon Session.

The meeting was called to order at two o'clock by Dr. Loring, who said that Professor Law desired to make a statement in regard to the disease now prevalent among the cattle in certain sections of the State.

Professor Law. I have asked permission to make a statement in regard to this disease, because of the real importance of the question to us all at this time.

For a number of years we suffered, in different parts of America, from pleuro-pneumonia, and it is due to the Commonwealth of Massachusetts to say, that the admirable manner in which that disease was stamped out of this State is a lesson to many on both sides the Atlantic. At the present moment, we are assailed by another disease, not so fatal as the pleuro pneumonia, but one which, to dairy farmers, is even worse, inasmuch as it interferes very seriously with the products of the dairy, rendering the milk absolutely useless and dangerous in its fresh state, and sometimes leading to permanent injury to the animals themselves. It is the *Epizoötic Aphtha*, or "Foot and Mouth Disease" of English writers. It has been imported from England, has prevailed to some extent in Canada for some months, and has reached the United States, certainly by one channel, Buffalo, and possibly by others. As the disease is not directly fatal, it is quite likely to exist in many different localities where its importance is not recognized. But since it is a disease propagated, in this hemisphere, at any rate, solely by contagion, it is of the greatest importance that it should be circumscribed wherever it is found, and stamped out. It can be very much more easily done than in the case of pleuro-pneumonia, but it requires an effort.

The nature of the disease is that of an eruptive fever. It produces a febrile state of the system, an elevated temperature of the body and mouth, some costiveness, bleeding teats, tightness of the skin ("hide-bound" it is usually called), and an erection of the coat, or a "staring" coat. In short, the animal seems out of health for a day or two, refuses its food partially or entirely, not from loss of appetite apparently, but from soreness of the mouth, and in the course of one or two days you find that it attempts to eat, but fails to masticate, fails to chew its food and swallow it; it begins to froth at the mouth, walks lame, and shows a tenderness of teats, if it is a milch cow, when milked. You examine carefully into this, and find that in the mouth, on the teats of the udder, and in the space between the hoofs, you have little blisters, in many cases extending half or three-quarters of an inch across, rising on the tongue, on the teats, and in the spaces between the claws. In a day or two days these blisters burst, and where a number existed together, as for instance in the upper jaw, you find raw surfaces, sores, ulcers, and shreds of skin hanging loose, and you find at the same time the blisters bursting on the teats and between the claws, leaving sores there. Many cows do not lose their milk entirely, and the operation of milking not only breaks the blisters to begin with, but continually irritates the sores; and if the milk is not drawn away the bag swells, becomes inflamed, and in some cases the bag is ruined. In other cases, from going in mud and sand, or otherwise, the cows have their feet permanently injured. In the place of simple sores or ulcers between the hoof, those ulcers extend, matter forms beneath the hoof, and goes on extending, so that by and by in bad cases the hoof will be thrown off, the animal walks upon a raw, sensitive surface, and if still exposed to filth, there may be any amount of disease resulting.

Such are the general features. First, simply a little fever, which you may see in any disease; secondly, this tendency to lameness, frothing at the mouth, soreness of the teats, with blisters rising upon them; thirdly, the bursting of those blisters with the resulting sores, which may or may not be kept up by external irritation. If left alone, in the course of ten or fifteen days the scabs fall off the sores, and the animal recovers. Sometimes the animal dies. In some cases the generative organs are affected, as in one case I saw yesterday where the animal had an abortion.

The milk is not only useless, but deleterious, especially when used in a warm state. Instances are not wanting of its evil effects upon the human system. A farmer in Dover, Mr. Preston, and his family, suffered from sore mouths from drinking this milk from his cows, before he knew what was the matter. A dog of Mr. Preston's suffered in the same way from drinking the milk. It had an eruption upon the feet, was lame, and smacked its lips, which is a marked symptom in these cases. Dogs and other animals which drink the milk are frequently purged by it, and children have been known to die from inflammation of the stomach and bowels consequent upon drinking the milk in a warm state, as it came from the cow. The milk itself does not seem to be diseased; the danger is that the liquid in the blisters will be mixed with it, either inside the teat or outside, and then it becomes injurious. Irritation of the abdominal organs is common in young animals that feed exclusively upon the milk. There is danger of permanent injury to the foot and the udder, not so much to the mouth.

As I have said, the disease is much more easily controlled than pleuro-pneumonia, and it is so for several reasons. In the first place the period of incubation is shorter. It rarely exceeds half a week, and usually in twenty-four hours after exposure the animals show some indications, either a hot mouth, or tenderness of the mouth. We do not need, therefore, to separate them for so long a period of time as in the case of pleuro-pneumonia,—a month or two months,—in order to make sure that they are free from the disease. In the second place, as far as we know, it is either not propagated by the air to any extent or only a very slight extent. It is transmitted by solid matter,—the dung and other filth among which the animals tread, and with which the virus is mixed up. I saw yesterday morning a number of cattle on one side of the road, in a field, every one of them suffering from the disease. On the opposite side of the road, separated merely by the breadth of the turnpike, was a lot of dairy cattle belonging to the same person, not one of which showed the slightest symptom. They had been there for a fortnight, merely separated by the road.

Such separation may be, at times, all we can do; but it is by no means satisfactory, inasmuch as any person, or any beast, passing from one herd to the other may carry the virus on his feet. Oftentimes it is carried in this way: A person goes among diseased stock, and takes away some of the virus on his boots, and that is left in the places where the healthy stock go. Dogs have been known to carry it in the same way, and it is a question whether rats do not do the same thing. Hence, with the short period of incubation, and with this tenacity of the virus, we have placed in our hands a very easy way of checking it. Circumscribe the diseased herds, allow no man or beast to go near them, except the man who tends them, and do not allow him to go to the healthy stock unless he changes his clothes and washes his hands with carbolic acid or something of that sort. Then he can do it with safety.

The prevalence of the disease in New York, so far as at present ascertained, has been mainly in Oneida and Dutchess Counties. It was imported into Oneida County from Canada nearly a month ago. In Dutchess County it has appeared within the last three weeks, and was brought there mainly by two herds, brought by drovers from Albany, along the Hudson River to Poughkeepsie, and travelled across the country from Poughkeepsie. Wherever the cattle of those herds have been scattered they have carried the disease. Some of the cattle of those herds have been traced to particular cars on the railroad. One of those herds stood a week in yards two, three and four, Avenue F, at Albany. They were brought, it is said, from Michigan. Some of them came from Canada. The question is whether those herds were not themselves previously contaminated.

Then we know where those cattle went to. Some of them were taken from Albany to New Milford and Kent and other places in Connecticut, and there the disease prevails more than in Dutchess County. As far as I have learned, no attention was paid to circumscribing the herds, so there is imminent danger of its being propagated from those animals. In Massachusetts, you must be in some danger. I believe that a great many cattle come from Albany along this Boston and Albany line, and the probability is, that it is being, at the present time, introduced into different parts of the State. It will be for you to consider what ought to be done under the circumstances. I should certainly advise that the importation by the way of Albany be at once discontinued, and the importation from Canada subjected to a strict supervision. Shut your doors against Connecticut, perhaps, until she can show a clean bill of health. Ascertain by circulars and by posting up notices in every post-office, where the disease has got a footing in the State, and circumscribe it. It can easily be gotten rid of now, by a little timely effort, and we shall be saved from great trouble for many years to come.

I have said that it is not very fatal. Sometimes it has proved fatal, but those were exceptional cases. But the English dairy farmer says he would rather have the contagious pleuro-pneumonia than this disease, it proves so troublesome, and is a source of so much loss to him.

Mr. MORTON, of Hadley. We have a disease in our town that was brought by a drove of cows that came from Connecticut. All those who purchased out of the drove have the disease among their cattle. Professor Law has described it exactly. On the first appearance of the disease they begin to drool, they will not eat their hay or meal, their tongues swell, and in the course of a day or two some will not or cannot eat at all. Give them good sweet hay, they will take a mouthful, roll it round awhile and then throw it out, and reject their meal entirely. None have died, but one or two have been so sick that a great many supposed that they had been poisoned.

One of our townsmen had some twenty-five steers out to pasture; he went after them, and on his way home happened to overtake this drove of cattle. They did not mix at all, but his steers took the disease.

There are five or six herds in Hadley that have this disease now, and nobody seems to know what the remedy is. Some have used potatoes and salt; they salt very freely and swab out their mouths, and some of them have got well to all appearance, so that they eat their hay well. If there is any remedy I should like to know it.

Professor LAW. The treatment is extremely simple. The disease will follow its own course. When it makes its appearance in an animal, the great point is to keep the parts clean, and allow him to go through it. It is like the small or cow pox, it follows its course and then subsides. What you want to do is to wash out the mouth with some cooling lotion or tincture. A wash of carbolic acid to one hundred and fifty parts water will answer the purpose. Wash the teats with one part carbolic acid and one hundred parts water, and apply strong carbolic acid to the space between the claws. Make them raw by drawing a coarse rag between them and then tie them up with tar. The great difficulty is to prevent the disease from spreading, and in order to do that you must guard carefully against dirt.

Mr. MORTON. One of my neighbors, who would not use the milk for anything else, thinking that nothing would poison a hog, gave it to his hogs, and they are in the same predicament with the cattle.

Professor LAW. Yes, sir. All animals with cloven feet are especially liable to it.

The CHAIRMAN. I hope it will teach him more respect for his hogs. They are entitled to it.

MARKETS FOR THE FARMER.

BY AVERY P. SLADE.

Having been appointed to open the discussion this afternoon, in order that I may not weary your patience, I have decided to be exceedingly brief.

Experience teaches that the free and universal expression of opinion by an audience, on a subject in which they all have a common interest, is the safest way to arrive at practical results. I feel assured that every farmer present feels the importance of improving his system of marketing his surplus produce, and I have no doubt that many present have important suggestions to make, or matured plans, which in the course of this discussion they will present to this meeting. Farmers are often undecided as to what crop will be in the best demand and bring the greatest price.

I believe as a general thing they decide in the fall what crops they will grow the ensuing year. And they are more or less governed by ruling prices, and those articles which from scarcity or other causes bring the highest prices at that time, are selected to be grown another year. The consequence is natural and obvious: the following year finds the market overstocked with that particular kind of produce and at prices ruinously low. In times past, when from drought or other causes there was a partial failure of any particular crop, we derived consolation by repeating the old saying, that a half crop would sell for as much as a whole one.

This was true to a certain extent before the age of railroads.

But the small crop of late potatoes which was harvested this fall throughout the most of New England, has had but a slight effect on the prices of that article in our markets. The deficiency in all the various crops the past season, has been more than supplied by shipments from distant States. Potatoes from Pennsylvania and Illinois, cabbages from Michigan and Northern New York, and onions from Ohio may be found in almost every market of any note in Eastern Massachusetts. These are significant facts, and indicate very clearly who in future are to be our competitors.

Next in importance to the production of a good crop, is the marketing the same to a good advantage.

Much of the pecuniary success in farming is attributable to good market facilities, and the peculiar tact that some farmers have of selling their produce at the right time and place, and in a way that will turn the greatest profit. Where a farmer is so situated that he can take his surplus produce on to his wagon and drive to the door of the consumer, he is sure to realize more for it than he can in any other way; while at the same time the purchaser gets a better article at a less price. This is decidedly the most natural, simple and economical way of marketing farm produce. Here, the producer meets the consumer face to face, their relations soon become intimate, and they readily learn to depend on each other. Were this system practicable with all farmers we should have no more to say. But unfortunately for many farmers, they are located so far distant from the great markets of the country, that they are compelled to consign their produce to some commission house, whose advertisement has accidentally caught their eye, and who have earned an enviable reputation for "quick sales and prompt returns." Whoever has had much experience in this method of marketing, and received in return the usual "net proceeds to creditor, trusting that the same will be both pleasing and satisfactory," need not be told how pleasing and satisfactory such returns often are. A large portion of the small fruits, milk and vegetables that are consumed in our large cities, in fact nearly all produce that finds its way thither through channels of public transportation, is handled by parties whose business it is to make money; that they succeed in their business we have abundant reason to believe. The freight, cartage and storage are charged to the farmer, and one-tenth of the gross receipts is the compensation required for selling.

One firm in Quincy Market sold in one day 28,000 boxes of strawberries, which at eighteen cents per box, would amount to $5,040. To say nothing of other sales made on that day, their commission on this fruit alone would amount to $504. And so with milk. The man who takes fifty or one hundred cans of milk from the depot daily and distributes it to his customers throughout the city, is in possession of a business which far exceeds in value the best milk farm in the Commonwealth.

I was recently told by a gentleman who possessed ample means of knowing the truth whereof he affirmed, that a certain man in Boston was in the habit of receiving one hundred cans or eight hundred quarts of milk per day, for which he paid $45. On the arrival of the train the milk was taken from the cars and placed on ice, and allowed to stand three hours. Then one quart was taken from the top of each can and delivered to ice cream saloons at the rate of forty-five cents per quart. The cans were then filled with pure Cochituate, and distributed at the rate of eight cents per quart to a choice set of customers, constituting one of the most desirable milk routes within the city limits. The gross profit of this transaction involves but a slight knowledge of mental arithmetic.

The man who does this business, uses a capital, invested in a horse and wagon, to the amount nearly of $500. Most farmers, I am aware, would object to taking *all* this business out of the hands of the contractor. But after divesting it of all the "tricks of the trade," and making a liberal allowance for bad debts, the net profits of a single day's work would by far exceed the net daily income of the best farm in the State. A system of marketing which will divide this profit between the producer and the consumer is not only a "consummation devoutly to be wished," but is absolutely demanded, as one of the first steps to be taken, with the view of making farming profitable. I am aware that much has been said and written upon this subject, and remedies prescribed for the evils of which we complain. And I am also quite certain that no system has yet been devised or adopted which has not in many respects proved quite impracticable. A very able writer, in an essay to the State Board some years ago upon this subject, strongly urged the institution of fairs or regular market days, to be held in different places at stated times throughout the Commonwealth. That essay sets forth in a clear light the numerous advantages accruing to the farmer from the establishment of such days, and we should rejoice to see them established in every large town or representative district in the State. But a moment's reflection will suffice to convince any one that that does not cover the whole ground.

Much of the produce of the farm is of a perishable nature, and must find its way to the consumer without delay. Such is the case with milk, some of the small fruits and early vegetables. Although regular market days would be of incalculable value to the farmer in a great variety of ways, yet we cannot conceive how it would help him in the sale of the articles above enumerated. Now, the farmer is certainly entitled to remunerating prices for his produce,—such prices, in fact, as the consumer is able and willing to pay. To devise some practical method by which these prices shall be secured to him is, I understand, to be the object of this discussion. While I do not feel competent to devise any plan which shall be entirely unobjectionable, it does seem to me that the coöperative system, a system wherein the farmer would have a common interest with the seller, would be found eminently practicable, and if adopted would speedily insure the best results. Besides offering him facilities for marketing, this system might be made to furnish him with important information relating to prices, the best time and method of forwarding his produce, and also the kinds and quality which the market demanded. I suggest this system without proposing to enumerate all its advantages, or to adjust the machinery by which such an organization is to be kept in running order.

Confidently believing that men can be found in every farming community—and in this meeting—capable of engineering the whole thing into successful operation, I submit the matter to your further consideration.

Mr. S. H. Howe, of Bolton, gave an exceedingly humorous account of his experience, demonstrating, as he contended, that amateur farming, at any rate, does not pay.

Hon. Charles G. Davis of Plymouth. I understand something of what may be called the egotism of travel, but, at the same time, I am so much impressed with what I have seen and learned during a short visit abroad, that I hope you will not consider it egotism in me if I allude to what I saw and heard in connection with this subject. I know it is unpleasant to hear a person speak of his own experience and observations, but that is what we want here.

I have been very much impressed for years with the difficulty of this subject, and I was one of those to whom allusion was made, indirectly, by Mr. Slade, who were interested in the scheme of market days and fairs. Mr. Fay, who was formerly a member of our Board, a son of Judge Fay, of this county, I believe, was very much interested in this subject, and he wrote one or two essays upon it, which were published by the Board. A united effort was made at one time, on the part of the Board of Agriculture, to see if the custom of weekly and monthly market days, which exists to a great extent in Great Britain, could not be established in this State. That effort, it is only fair to say, was an entire failure. It was found to be so contrary to the habits and customs of farmers and consumers, that it could not succeed. But what made it fail? It was owing to the fact that in a new and thinly settled country where all were farmers or producers it was not necessary, and that our people were not accustomed to daily markets, or to markets twice or three times a week, in the central villages and cities; because it was necessary to furnish a market for the perishable articles, those which are of daily use and necessity, as well as those which the farmer can sell at a monthly market, anywhere within ten miles of his farm. We all know that not only in Great Britain, but throughout the Continent of Europe, every city and every small village, even villages of not more than two or three thousand inhabitants, has its regular market days—Wednesdays and Saturdays or Tuesdays and Fridays; and in addition to that, once or twice a month it may have a cattle, grain or hay market day. In Europe also, every large city has one or two squares which are called "market squares,"—perhaps there are half a dozen of these squares in some of the large cities. But in addition to that you will find, on two or three days in the week, the farmers and market-women spreading out their goods upon the ground, or upon tables arranged for the purpose along some particular street; not only articles which are necessary for daily food, but also all kinds of light implements of domestic manufacture, and some of the cheaper articles of domestic use, such as crockery, cheap hardware, baskets, wooden-ware, cheap calicoes, woollens, domestic hosiery, and so on. In addition to that, in almost every village or city you find, upon those occasions, a large display of flowers, in pots and bouquets, the market for which is resorted to by all the inhabitants.

Now, gentlemen, what is there in the nature and habits of our people, now thickly settled, and engaged in trade and manufactures, that should prevent such a system as that growing up among us? I cannot see anything. This system is the result of the experience of older and populous countries. *Primâ facie*, it is better that the producer should meet the consumer face to face. Let me illustrate by mentioning one fact. I spent two months in Geneva, in Switzerland, last season, and boarded with an old lady of seventy years. Two mornings in the week she hired a carriage—not at four or five o'clock in the morning, or sometime before daylight—but at seven or eight o'clock in the morning, went to the market and purchased in the street of the various market men and women all the provisions for her family until the next market day, and brought them home in the carriage. The market women assemble there, not necessarily at three or four o'clock in the morning, except that the earliest comers get the best positions, and they are not driven away, as they are in Market Street, Boston, at nine or ten o'clock, but remain until two to four o'clock in the afternoon. The producer and not the buyer fixes the price, but at whatever price the producer can furnish the article, at that price it goes into the mouth of the consumer.

Now, I lay down the proposition, that if we are independent people, if we are sensible people, if we have that common sense which we are so fond and justly fond of attributing to the universal Yankee nation, we, who are engaged in farming, or identified with the farming interest, should not permit the exactions, the extortions and the robberies to which we are subjected, day after day, and hour after hour, by the middlemen of Massachusetts and New England. (Applause.) I say to you, Mr. President, that if you will require by law—a law which the cities and towns cannot resist—that every town of four, five or six thousand inhabitants and upwards shall furnish free ground for the producers of Massachusetts to meet the consumers daily, face to face,—much as I respect and believe in our agricultural societies, our agricultural colleges, our agricultural science, and our veterinary science, I believe you can do more for the interests of agriculture in ten years by such a law than by all these other agencies combined.

I heard of a case the other day of a man who went to a provision store in Boston, and said, "What do you sell your strawberries for?" "Forty cents." "But I want to sell: how much will you give?" "Well, if they are well picked, I will give you ten cents a box." I want you, gentlemen, to reflect on what is involved in that remark. It tells the whole story, and if I should talk from now until doomsday, it seems to me that I could not say anything more than is contained in that illustration.

Let us demand that some system shall be adopted under which there shall not be one, two, even to four or five middlemen standing between the producer and the consumer, and if we can succeed in securing the establishing of such a system, we shall do something that will be of immense value to the agricultural interests of this State.

I think this question is more important than any other that can be presented, so far as the wants of the common farmer and gardener are concerned. Why, even here in the town of Framingham, there are very many persons engaged in manufacturing and in professional pursuits, who do not raise what they consume from day to day, and if there was a free, open market to which everybody could resort, it would be of service to the farmers in this immediate vicinity, and of greater service to those who purchased from them. Let us divide this profit, which is made by three, four or five middle-men, equally between the producer and consumer. Let the man who by the sweat of his brow produces all these articles of our daily food and sustenance get better pay, and let those of us who purchase the same pay less, and both of us will be better off. The tendency in this country to-day seems to be, in everything, towards monopoly. We see it in railways and telegraphs, in banking and speculation, in breadstuffs and staple provisions, and in dry goods; but it has even reached the market for our daily food. And it seems to me it is time for the farmers of

Massachusetts and the consumers of Massachusetts to open their eyes to the importance of this question, and say that this thing shall not be done any longer.

I want you to look at this matter broadly, throwing out all narrow considerations in regard to any personal friendships you may have for the middle-man, or the commission merchant, or the produce dealer. I ask you to put the question in regard to most of the articles you purchase or sell, as producers or consumers, from day to day, whether there is any reason why there should be such a discrepancy between the price which the farmer gets for an article, and the price at which it goes into your mouths? We are apt to consider only those things robbery which are called robbery, that is, the taking of property by force from the pockets or houses of men. I speak not of moral aspects, I make no charges of crime; but, in point of fact, what greater robbery is there in that, than for a set of men who are not producers to assume to take all the profits of the labor of mankind? That is the tendency to-day in regard to everything, and it is especially the tendency in regard to farmers.

I believe I have stated strongly enough in what I have said, what I mean; perhaps I have stated it too strongly; but I want to set your minds thinking on this subject. It seems to me that it is a question worthy of earnest consideration, whether a law requiring every town of over five thousand inhabitants to provide some suitable place, with shelter for teams, where those who have produce to sell, themselves being the producers, or their immediate agents or servants, may meet the consumers face to face, would not be of great service to both classes.

It is no use for us to say, and it is no use for a committee of the city council of Boston to say, as was said in a recent report, that Boston is differently situated from other cities in the United States, and that the markets there have not enhanced prices. It is a fact, and it must necessarily be a fact, so long as we know that two, three or four thousand dollars are given for single stalls, 10 by 15 or 20, in Faneuil Hall market. Mr. Quincy has said that when he was mayor of Boston, he knew of a case where hundreds of bushels of peaches were thrown into the dock below Faneuil Hall Market early one morning, rather than allow them to be sold at a reduced price. I know of other cases where the same thing has been done in regard to poultry and meat. These men make so much money that they can afford to throw these things overboard six or eight times during the summer, rather than reduce the price of a staple in which they are dealing a cent a pound or a dollar a ton; and as long as these facts exist, it is idle to say that Faneuil Hall Market is not a curse, not only to Boston, but to Massachusetts. It is time the attention of our farmers was directed to this subject, and we of the country should demand of the legislature that we have free trade in Boston, and free access to the people of Boston. I am tired, for one, of seeing committees of the city council, year after year, appointed to consider this question, who travel all over the country, and come back and say that nothing can be done. I am tired of seeing new markets going up, to be let out in this way to these monopolists. I want to see some plan adopted by which the people of Boston can, every day, meet the producers, and learn something of the value of the articles they consume, and what they ought to pay for them.

The committee of the city council state that the suburbs of Boston are thickly settled, and therefore gardening cannot be carried on in its immediate vicinity. Therefore, if I understand them, free markets can do no good. In other words the suburbs of Boston are Boston. But is Boston with its suburbs larger than London, where almost everything is sold in its streets. The "London cries" are proverbial. Are Boston and its suburbs more extended than Paris and New York? Why, gentlemen, the committee of the Boston city council give that as a reason, for not having a free market, which is the result of the monopoly and exclusion which they would perpetuate. The present system has driven out of existence the numerous and worthy class of small farmers, the peasantry, which are found in the neighborhood of all large cities; your organized market gardeners remain, but the men who sell the single products of their own industry, from their small plots, are not to be found. I care not whether they would be Irish or German, Americans or Norwegians, this class of small farmers is extinct, because no opportunity has been allowed them to market the small products of their daily labor. Encourage such a class, for whom there is still plenty of room within ten miles of the city hall, by free markets in the streets; alter the habits of your people by purchasing from the producer the articles of their daily food, and you will soon find that an open market can be found for the larger farmers and the larger products of the more distant producer, even to the remotest sections of the State.

Mr. Nourse, of Westborough. I suppose there is no law against a young man asking a question here. I was sorry to see at a gathering I attended lately,—the meeting of the Milk Producers' Association of Massachusetts and New Hampshire,—that the young men were not sufficiently interested to be present. If they are interested enough to be farmers, they ought to be interested enough to attend meetings which affect farmers, and thus become posted in regard to the important matters which are discussed at those meetings. I came here especially to-day that I might hear the discussion of this question this afternoon.

It seems to me that the suggestions which have been made in regard to markets being held twice a week in the larger centres of trade does not meet the great want which we feel, after all, in regard to marketing the large portion of the products in which many of us, at least, are interested. The more perishable products of the farm, it seems to me, cannot be marketed in that way. How shall they be marketed so that the immense profit of the middle-men shall be, a part of it at least, placed in the pockets of the farmers? We are willing, I am sure, to share it with the consumers. But here is a question which, it seems to me, is worthy of discussion and candid consideration. Is there not some way by which our small fruits can be taken to market and we realize something near the cost of producing them?

At that meeting to which I have referred in Boston, an arrangement which had been made for carrying the smaller fruits and more perishable vegetables to market was described, which it seems to me it would be well for those interested in marketing such articles to consider. An arrangement was made with the railroad corporations by which they took a crate or a barrel or anything not exceeding a barrel in size, carried it to Boston, took it down to the place of sale, and returned the empty crate or barrel, for a quarter of a dollar. The farmer then knew exactly what it would cost him to have his article carried to market. Sending it to some reliable merchant or commission dealer, who charged him ten per cent., he knew precisely what he would get for the article. It was represented that the farmers had been well pleased with this arrangement.

Allusion was also made to the way in which produce is carried to the New York market, a car being furnished by the railroad corporation, and the farmers allowed to send their milk or whatever they have to market, without being subject to the multiplicity of charges to which we are exposed under the present management of this trade.

Mr. Hapgood, of Shrewsbury. I am engaged somewhat in market gardening. I commenced the business in 1865. I thought I would raise a few things to sell, any way, though I never expected to make much money. I planted some cucumbers, and raised a fine crop. There was a man in our place who carried some things to market, and I called on him and asked him if he could sell my cucumbers for me. "Yes," he said, "how many have you got?" I told him I might have twenty-five or fifty bushels. He said he didn't know as he could sell as many as that. I told him I thought he could, and in a day or two he took three or four bushels to market, sold some of them, left some of them in one place and another, and brought home some, and that was the end of it with him. Well, I called on my brother, who had had more experience than I had, and he came and looked at my crop. I asked him what he could do? "Well," says he, "you are better acquainted in Worcester than I am; take them yourself, and go round from house to house and sell them." I told him I couldn't go peddling them round. "Yes, you can," said he, "take them there, you can sell them." Well, I did. I took a load and went to Worcester, and finally sold the whole crop. Since then, I have raised cucumbers largely, a hundred bushels some years, and sold them too. Last year, I raised seven or eight tons of cabbages. It was a very unfortunate year for cabbages, as a good many here have found out, and I sold them for two dollars a hundred.

Lest I should be tedious, I will state that the coöperative plan strikes me most favorably. We can have an agent in our cities and towns, wherever we want to send our produce, and send it to him—sparingly at first, but after a time I think he would be able to sell all we raise. We could employ him on a commission or pay him a salary, or compensate him in whatever way we thought best.

I want to tell you a little more about my crops, for I reckon myself a lucky man. I have an order now for a hundred tons of my turnip squashes. I have got tons of my fancy cabbage, which I am holding for a hundred dollars a ton. One of the high fancy kinds, I hold for one hundred and twenty dollars a ton, and I have some orders for them now. So that, after all, Mr. President, I hope the farmers here will not feel very bad about the farming business. If we have a good farm and raise good crops, I think we can sell them and make something, after all.

I want to say a word about my corn. I raised some corn this year, not many acres, and I will say that my farming is not very large. I do it to occupy my time, and what I raise I mean shall be first-rate. You will be surprised when I tell you my manner of cultivating corn. I spread on my field fifteen loads of manure to the acre, then I manure in the hill moderately, making in all about twenty-five loads to the acre. I plant it carefully, hoe it carefully and harvest it carefully. I measured my land and I measured my crop, and I raised this year seventy-six bushels of corn to the acre. I have got ears of corn about as long as a gun-barrel. I have heard tell of ears of corn fifteen inches long. I did not quite come up to that, but I came within an inch of it. If you will come to Shrewsbury, I will show you twelve ears of corn that will measure twelve feet.

Mr. BROWN, of Framingham. I am a firm believer in local marketing. I have had some considerable experience the last year or two in this large town. Last year I was very successful in raising a celery crop. I found that my neighbors were willing to accept it, and come after it, and thank me for it. This year my crop was larger than last, and there was a scarcity in the market, but still they were willing to accept it, but they wanted me to send it to them. Therefore I believe in local markets.

J. B. MOORE, of Concord. I do not propose to take much of your time, but as this matter of marketing by railroad from Concord has been introduced, and as it happens that that subject was brought to the notice of the Farmers' Club by myself, and I acted as agent for the club in making that arrangement, I will say something about it. I have no doubt that gentlemen on the lines of all the railroads could make a similar arrangement for the transportation of their products to the large cities.

Concord, by railroad, is twenty miles from Boston, and from sixteen to eighteen miles by the travelled road. The difficulty we found in raising considerable quantities of fruits and vegetables for Boston market was the expense of getting them there. In the first place, we found it necessary, being that distance from market, to raise some product that was light freight. You will find, therefore, that we raise at Concord, strawberries and other small fruits largely, asparagus more largely than any other town in the State, and other articles of light freight. Until this year, everything of the small fruit kind had to go to market on wagons, and the result was, that it became necessary for us to pick the strawberries and send them to market at night, because the morning market is the large one. I thought we could make some arrangement with the railroad by which we could do better than that. I went to the superintendent and president of the Fitchburg Railroad, and told them that the Farmers' Club desired to effect some arrangement whereby we could get our strawberries, which were put up in crates mostly, holding about a bushel, and our asparagus, which was put up in boxes, perhaps fifty bunches to a box, to market at a reasonable rate. I asked them if they would carry them in the cars, and they said they would. The next thing was the terms. They wanted forty cents a crate for the strawberries and forty cents a box for the asparagus. I told them we could carry them cheaper than that by wagons: that was entirely out of reason. They wanted to know what price would be a fair price. I told them about twenty-five cents. They agreed to that, and then I said to them, "I haven't got through with you yet. I want you to carry those strawberries on every passenger train during the day." They said they could not do any such thing as that, it would cumber up every passenger train. Then I argued the matter with them in this way: "Two crates of strawberries are fifty cents. That represents a passenger. Those two crates do not take up so much room as a passenger, and you do not give half the accommodation. Now, I want you should take them to Boston, and deliver them at the market-house, and send back those crates for twenty-five cents." They said they would do it, and they did it, to the entire satisfaction of the farmers. The strawberry crates would come back anywhere between twelve or twenty-four hours. The asparagus went down mostly in the morning, and the boxes would come back the same night. They did the business promptly, they did it well, and they handled the freight carefully. The superintendent of the railroad told those baggage-men who were put in charge of this freight, that any damage from bad handling would be deducted from their wages and paid to the freighters, and that prevented bad handling. Therefore, we got all our products carried in good condition.

Then the next thing was to get barrels of perishable stuff, like pease and corn, which must go to market pretty quick after being picked, carried to Boston on reasonable terms. They proposed to carry these products for twenty-five cents a barrel on the passenger trains, and they did that, and did it well. They have carried pickles at the same rate. The pickles usually went on the milk train, and on some days a great many barrels of pickles were sent to market in that way.

I have no doubt, as I have said, that you can effect some such arrangement as that with the lines on which you live. Believe me, when I tell you, you cannot raise cabbages, and send them into Boston market, for two reasons. The first is, that they exhaust your land too much, and you cannot afford to buy manure so as to make it a profitable crop to raise and send to market. That has been my experience.

In regard to the other part of the question, I would say, that the city of Boston does not furnish market facilities as it ought to. The people of that city are the losers, as much as the farmers. They pay a great deal more for what they consume than they ought to, and we don't get as much for growing it as we should, if they would furnish a large space, with open sheds, where farmers could stand until they sold their products. Now, if my man goes to the market after a certain time in the morning, they drive him off the street. It is true, you can comply with their rules by driving around a square, and coming back to the same place, but that is rather an inconvenient way, and I think the consumers there pay for that, to some extent. It is an annoyance, certainly. What they want is a piece of land, anywhere from five to six acres, with covered sheds, so that a man can drive under the sheds, and stay there until he sells his fruit and vegetables, or anything he has to sell. Give him a chance to sell them at wholesale or retail, and give him a chance to stay under shelter, so that in case of a storm he shall not be forced to give his things away. For instance, grapes, of which I sell a number of tons. Last year I found I could do better than to have those sold on commission. But strawberries and asparagus, I do not know how you can sell them in any other way than by commission. In my vicinity, we are growing large amounts of these things. There were days last year when there were two hundred crates of strawberries sent from that station at Concord, to Boston market. That means sixty-four hundred quarts. That is a large amount to sell, and going in these ventilated crates, it is rather necessary to sell them by the crate. Then it is necessary for the producers, that those men who sell the strawberries should duplicate the crates, and send them back other crates as soon as they receive theirs, because, as many of these strawberries are shipped down to Portland, the British Provinces, and to great distances, the farmers who raise them cannot afford to find the crates, because they would not get the use of them more than twice a year; therefore, those men who sell them, and have ten per cent. commission, have to furnish something beside the selling. I presume Sands, Furber & Co. have two thousand dollars' worth of crates, which are necessary for them, in order to do their business.

I am not at all surprised at the statement made by Mr. Davis in regard to a provision dealer in Boston proposing to buy strawberries at ten cents a quart, when he was selling them at forty. Perhaps you are not all aware that there is a difference in the price of strawberries. Nice, handsome fruit may be worth forty cents a box, when some other isn't worth twenty; no good strawberries were sold last year for ten cents a box. Some strawberries went from our town that were not fit to send to market. A man has no business to send strawberries to market in such shape, and expect to get much for them. There were times when some crates of strawberries, very large and handsome, were worth forty cents a quart, and other strawberries standing right by the side of them were not worth over fifteen cents. There was that difference in the fruit. You will find sometimes a fancy farmer who will send in some of that stuff, and then he will wonder why he cannot sell it.

Mr. Barnard of Worcester. I have been raising vegetables for the market to a greater or less extent for the last quarter of a century, and I have found it more difficult to dispose of the vegetables than to raise them. We tried a free public market in Worcester, but we found, although it worked well for the first few months, that people were not disposed to come to the market to buy vegetables. They would rather follow the old custom of going to the market-house and having the vegetables sent home. If they bought at the public market, of course they were expected to take them away in their baskets. That seemed to be one difficulty. Furthermore, the farmers were not disposed to give two half days, perhaps, in a week to go to market with their products. There was still another difficulty. Perhaps the consumer would come to the market, and would not find the producer, and then the producer would come there, and the consumer would not be there ; so the public market has not been as successful in Worcester as it has been in Philadelphia and other cities ; and now we have to carry our products to the market-houses, and sell them for the most we can get. But it seems to me if the cities would establish public markets, the people would accustom themselves to visit them, and farmers would find it for their interest to devote two half days in the week to selling the products of their gardens. Then, when the producer and the consumer come face to face, if they cannot make their interest mutual, I do not know who can do it for them. I think it would be best for both parties, but they have got to be educated into it.

Mr. N. S. Hubbard of Brimfield. This is a matter which is of great consequence to the farming community. The only thing that we can do, that will be of great benefit to the farmer, is to devise some plan in which the middle-men shall not get too large a share of the profits. There are articles that can be taken into the market, as the gentlemen have represented, and sold to a very much better profit to the producer than under the present system, probably ; but if a man is living seventy or eighty miles back from the city of Boston, where his produce is marketed, he cannot go with the produce of his single farm to Boston and sell the articles; he must employ somebody to do that business. For instance, there is the article of cheese. What shall be our course in selling our cheese? Can we take any better course than we are now following? It is said that we should send our cheese to market, and employ some man there to sell it for us. When we send it there to be sold on commission, we endeavor to get it done as cheaply as possible. I never have paid over five per cent., and many times much less than that. Supposing we should go with our cheese to these free markets that have been spoken of, and it was not all sold; then there would be a surplus left over, and it would have to be stored somewhere. Now, these men who are selling our cheese, and are selling other products, furnish the room to store it, and it is our business to look sharply after them to see that they are not getting too much. We must either let the man who is in Boston do it, or send another man there, who will be precisely in the same condition. For instance, I might kill one hog at a time, and perhaps I should have three hundred pounds of pork to sell. I cannot afford to go to market to sell that pork myself, but some one else will do it, and my business is to see that he does not get too large a share of the profits. That is what we are all aiming at; to see that the middle-man gets his share, and the farmer his share.

There must be some way to get rid of the products of the farmer, beyond what the farmer wants for his own use, and one question is, what is the best way to do it? For instance, take the article of milk. The gentleman from Westborough knows very well about that article; what shall we do with it? It must go to market. I am living some seventy miles from Boston, and have been engaged in sending milk there for fourteen years. We claim to be a more honest set than the gentleman says those middle-men are. We would not like to turn off a quart of cream from every can of milk, and sell it to the confectioners, as the gentleman says it is sold, for forty-five cents a quart, and by that means get a large profit, and then fill up the cans with water, and pretend to sell it for pure milk. But if we should have an agent there, I do not know what the result might be; the temptation would be just the same to him to turn off this quart of cream, and sell it for his own benefit, and then fill up the cans with water. There are a great many things of which we have only a small quantity to send to market, and these must be combined together. From the town of Warren, where the milk went, there was a carload went every day to Boston, and before it started from Warren, it was sold at a stipulated price. Now, a great deal of the cheese that goes from the factory is sold in the factory, and we sell it at the best price we can get, studying the markets in the different places to know what they are ; but we have sent some to the city of New York, and never have paid over five per cent. for selling it, and usually we have paid half a cent a pound, or less. If we thought we could do better than that by having an agent in Boston, of course we should adopt that plan. It is for the interest of the farming community to study the markets, to exercise the best economy they can, and endeavor to get these things from the farms where they are grown to the consumer, without letting too much of the profit go into the hands of the middle-men.

I look upon the agricultural interest as the foundation of everything else. Every man must have his breakfast before he goes to work, and then his dinner and supper, and it all comes from the farmer. There you get down to the foundation. If a man makes five hundred dollars a day, by buying and selling stocks, is the world any richer ? He has got an accumulation of labor and earnings. The money is not made rapidly ; it comes out of mother earth in some way, and by gradual and slow processes, and if he gets five hundred dollars a day, he does not get it because he has made the world five hundred dollars richer ; but what a man gets out of the earth, what he produces, makes the world so much richer. If anybody raises a bushel of grain, he has made the world a little richer. It seems to me, that every one of us should aim to do something in some way, to make the world a little richer.

Hon. Charles G. Davis. I wish to allude more fully to one fact which I consider important, in regard to this matter of open markets. I think the present system grew up from the fact that originally everybody in this country was a producer, and that the present system of marketing in the neighborhood of large cities, has destroyed all the small producers. For instance, Mr. Moore says, the people up in Concord raise so many strawberries, that they could not sell them in these open markets. That remark leads to an illustration of what I think would be the result of having an open market. If you had open markets for twenty years in the city of Boston, there would gradually grow up in the neighborhood of Boston, or would remain there, a large body of small producers.

It would be for the interest of the State and of the consumers, to have a class of small producers establish themselves in the neighborhood of these large cities. This class of men, I repeat, is dying out in Massachusetts. In Philadelphia we used to see the German women in the market. They would come in and sell their ten, twenty, thirty or forty baskets of strawberries, a week's butter, and so on. If we had a class of such persons, working upon one, two, three, or four acres, within ten or fifteen miles of Boston, it would be to the advantage of the city, and to the advantage of the consumers in the city. It seems to me that under the present system, that class of people is crushed out entirely. We have no producers who market their own products on a small scale.

Then I think the result is, that people become reckless with regard to the price they pay; they think they must submit to whatever price is charged at the retail store. But such a system of free markets would surely lead to the purchase of articles in larger quantities, and tend to an easier sale of the products of the larger farmer or market gardener. But so long as our people do not confine themselves to specialties in farming, such a market is more needed by the miscellaneous producers than by the man who confines himself to special products, because the latter is better known and better knows his market.

Every means should be resorted to in order to destroy the monopoly that exists with the larger agents. If there was a free market, where, if a man bought a dollar's worth, he would save more than enough to pay a boy for carrying his basket home, that would remedy the difficulty spoken of as existing in Worcester. The consumer would buy so much cheaper, that he could at least afford to pay ten cents to a boy to carry his basket home. I think the influence of those free markets would be to keep the price at such a point, that the Faneuil Hall men could not set the price, or keep up monopoly. The people would know where they could go, and what would be a reasonable price for them to pay, and for the producer to receive.

The CHAIRMAN. Having had some experience in regard to market days, and having been engaged on the committee to which the gentleman alluded, who made the attempt to establish them in this State, I want to say a few words on the subject.

So far as free markets are concerned, I agree with Mr. Davis entirely. I have never been able to see the slightest reason why such a monopoly should exist as now exists in the city of Boston. I cannot comprehend it. I see no argument for it, even from its friends; none which an intelligent citizen ought to accept. But this system of market days was found to be entirely inconsistent with what may be termed the feelings, tastes and interests of the producer. Let me illustrate. We were told by the gentleman who brought the system from England, where he had observed it carefully, that it would afford us an opportunity to go into the market squares of the towns where these markets are held, and buy hay and other produce by looking at the samples, and leaving our orders; so, if I wanted two hundred bushels of oats, I could go to Danvers, for instance, on market day, look at the samples of oats, make my choice, and have them delivered; and so of hay and other articles of that description. But it was found that there were no samples there. The grain coming from the West in large quantities was held in the great centres, in the large towns and cities, and it was a great deal easier for a man to go to his own dealer, and order fifty or a hundred bushels of grain, than to rely upon samples brought in exceptionally on market days. We were told, too, that any parties having cows to sell would drive them in there, and the purchasers would naturally appear; but it was found that the competition was not of that kind which was what the sellers wanted, in order to give them a fair price for their commodity. There were a few cows in the little market, but very few purchasers, and it was soon found that the whole system of trade, as established in this country, was deranged by that method; and the gentlemen who brought their cows were glad enough to get them back on their own farms, and the gentlemen who came there to buy, were glad enough to follow them up, so as to sit down and make the trade right on the threshold of the door. It was found to be utterly and entirely inconsistent with our organization of society and our methods of doing business, and it could not be developed into proportions large enough to make it succeed with us. It succeeds well enough in England and on the Continent of Europe, because there are no such producers there as Mr. Moore has alluded to in Concord,—gentlemen owning large tracts of land, producing large quantities of fruit or vegetables, and putting their products together and sending them to market. The persons coming into the market towns of Europe are generally small producers. I have seen in Switzerland, for instance, a little bull hitched to a wagon, and a girl fourteen or fifteen years old driving him, with about as much in the wagon as half a dozen wheelbarrows would hold, the produce, perhaps, of her father's farm for the day. It is a little business. It is the smallest conceivable mode of transacting business. That is not the way things are done here.

Mr. Moore has told you what has been done in Concord; it is a good plan, and one that can be adopted anywhere. The lesson to be drawn from what he said is to raise in your own locality what you can send profitably to market. Mr. Howe cannot raise cabbages in Bolton, and get them to market at a profit; I can, living within half a mile of the market of Salem. It is utterly useless for a man who has a farm a hundred and fifty miles from Boston, to make an attempt to raise strawberries for the Boston market, but he can raise an endless variety of commodities that he can put into barrels and bales and sell there. We can raise onions and wheat and barley in proper places, and send them to the great markets. There is one section of this State,—the county of Essex,—in which farmers are obedient to that law which we have laid down. They produce on their farms what is adapted to the market in which their farms are located. There is not a cabbage, nor an onion, nor a potato, nor a bushel of pease, nor an ear of sweet corn, nor a bushel of turnips, nor a ton of hay, nor a quart of milk, raised in that county, that has not found a channel through which it flows readily and profitably to market. Let me illustrate. The market of Lawrence sprang up about the year 1845 or 1846. I knew the region round about it well. It had been occupied by what we call general farmers. They had been industrious and prosperous. They raised a little wool, a little pork, and corn and potatoes, some apples and cider, and they kept along in that way. But the instant the market of Lawrence opened, the sons turned themselves into expressmen, and the daughters of one of those farmers at least, whose father had died just about that time, turned the old farm into the production of vegetables for the Lawrence market, and it was not three years before those two girls had the best barn in the town; and in three years more they had as good a house as there was in the neighborhood, and in five years more they had cleared mónoy enough to retire and sell their farm to the first purchaser who came along.

My farm is situated within half a mile of Salem, and I never raised anything in my life that I could not sell the instant it went into market. My market wagon starts in every morning, and the vegetables are delivered from it by the ingenuous young man who goes with it. There is no middle-man to divide the profits. My milk wagon follows the vegetable wagon, and there is a milk route that goes with the farm, just as much as the pasture lands and fields go with it.

This same rule is adopted by the farmers in the vicinity of Newburyport. I know one man who is a prosperous farmer, who never did anything else but carry on a milk farm, and never would try to do anything else. He has loaded his market-wagon for the last twenty-five or thirty years with what milk he could produce on his farm, and on top of his milk he puts as many vegetables as he can haul with one horse, and he is as prosperous a farmer as there is in Essex County.

So it is with tobacco in the Connecticut Valley. That is the appropriate place for it. The farmers in that valley are growing rich by raising tobacco, because they have selected the crop adapted to their locality. There is the little town of Sunderland up on the river, where the farmers are growing rich, by devoting themselves to the cultivation of onions and tobacco. There are eight hundred and sixty-five men, women and children in that town, and you do not meet any one of its citizens in the cars, or anywhere else in this State, who does not ask you, the first thing, if you come from an onion region, "Will you be kind enough to tell me the price of onions?" They are just as keen and shrewd for the market in that town as the wool-growers of the West to find out the price of wool, or the cotton-growers of the South, or great wheat-growers of the North-West. They understand the business perfectly well, and the agriculture of that town is so well managed that the amount of artificial manures carried into that place would astonish you as it did me,—ton after ton of superphosphate and Peruvian guano, and all the ashes that can be purchased within twenty-five or thirty miles of the town.

This is the secret of the whole business—the selection of the proper crop for each particular locality; hay, where it is a hay farm, and onions where it is an onion farm; rapidly perishable commodities for the local markets. Wherever you are situated adapt your business to the locality in which you live. If you follow these rules there is no piece of land in Massachusetts to which a certain form of agriculture cannot be applied which will be profitable.

It is a very easy thing to say that farming is not profitable. Mr. Hubbard has told you the whole story. Why is it the great profitable business? It is the foundation of everything else. Mills stop, ships sink, banks suspend; but it is the land which really keeps the whole machine in motion, and makes the community really and substantially rich. Three thousand millions of dollars' worth of agricultural products in this country within the last year! Let the manufacturers tell such a story as that if they can. Of all the articles exported into foreign markets from this country, to give us a substantial financial basis abroad for the nine months ending the 31st of March, 1870, two hundred and fifty-five millions out of three hundred and eighty-seven millions were agricultural products. One hundred and seventy million dollars' worth of cotton; sixteen and a half million dollars' worth of tobacco; eight or ten million dollars' worth of wheat; five million dollars' worth of bacon and hams; seven million dollars' worth of cheese; and so it goes all the way through the two hundred and fifty-five millions. That is the relation that agriculture holds to the financial world, and to the financial success of our country. I tell you there is no crop that a man can possibly raise for which he cannot find a market, if he will only by some ingenuity or other find a channel from his farm to his market.

Mr. Moore has told you, and told you well, how he has been able to manage the railroad in Concord. You can do the same thing all over this State. I venture to say that there is no railroad company in the Commonwealth bold enough to defy the farming community that lives along its line, when that community demands a fair, just and reasonable mode of sending their crops to market. It is, therefore, only for you to ascertain what you can send to market from your respective localities, and avail yourselves of the opportunity. The selling of milk which has been so much discussed, is the one troublesome problem. I have suggested over and over again to the milk producers, that they should establish their own agents in the markets where their milk is sent, but they have not seen fit as yet to adopt the suggestion. I do not know that they can with safety; I am not sure about it; but I do think if we who are producing milk could agree in our localities for a certain season of the year what would be a profitable price for ourselves, the contractors would pay it. If they are selling milk in the markets of Boston for eight cents a quart this year, and you are delivering it to them so that they can get a decent profit from it at that rate, and next year you cannot afford to sell it to them for the price at which you are now selling it, they will give you whatever price you agree among yourselves is fair and reasonable. It only needs a combination among the farmers in a given locality, and the placing of the matter in a proper light before the contractors themselves, to bring those men to terms at once. That is my view of the matter.

I have taken this occasion to sum up what has been said this afternoon upon this subject, because the discussion has been really an interesting and valuable one, and the question is one which lies at the very foundation of the whole interest of agriculture.

Mr. Lewis of Framingham. I want to say one word on this subject of free markets. I think if this Board should suggest to the city of Boston that the farmers of the State wanted some proper place to market certain articles, they would consider it. There are some stalls in Faneuil Hall Market that are worth over three or four thousand dollars a year premium. The rent itself is merely nominal in comparison, but it is not near low enough. There are two or three bank presidents in that market who do a very large business. They ought to have their offices up stairs where the agricultural implement warehouse is, and make room for small retailers below. The gentleman says that hay passes through Essex County into Boston. I want to say to you that very frequently the farmer goes from Framingham, and from other places in this vicinity, into Boston with hay, and he has to stand with his load out in the street in the rain, because there is no place of shelter for it. If the city of Boston could have, as they have in Liverpool, a large yard of some two acres, and have cheap sheds erected under which such teams could be driven, and their contents disposed of, it would be a great advantage to the city, and a much greater advantage to the farmer.

Now with regard to disposing of green crops. There are people near enough to markets who can carry in things very profitably with their own teams. There should be some place where they can go without being ordered out. If there was a particular square which could be used as a hay market, where farmers could drive their teams and sell at wholesale, as they do in other places, we should experience very great benefit from that arrangement.

Now in regard to the selling of milk. I think that matter is entirely misunderstood. The business is not properly carried on in this country. These milk routes are worth from one to five thousand dollars—simply the route, without any horse or wagon, or milk. It is simply the right to sell milk to a certain number of people. Now what do they do in the old countries? I have seen stores where they sell the article of mixed mustard and nothing else. Suppose we had stores in Boston where people could rely upon finding Framingham milk, and getting the genuine article, would not such a store be encouraged? I say it would. There is no reason why the selling of milk might not be made as much a business as the selling of forty other things that might be mentioned. It is an article of prime necessity, and I think if the farmers would present the subject to the city authorities, it would be properly considered by them. It has been supposed here that the farmer could save his five per cent. by the establishment of free markets. I say you can get merchants of the highest respectability, who will do your business for two and a half per cent. They will do it just as low as they can afford to do it. What folly it would be for the dairymen to undertake to ship their cheese to Europe, make all the arrangements for freight, and attend to all the details of the business, when they could do it so much better and more cheaply through gentlemen in the city, who are very much better acquainted with the business. The farmers around Liverpool come into the city with their vegetables and small fruits, which they dispose of at the very highest prices. I undertake to say that that is the very best way in the world. I have realized over eighty dollars from a load of flat turnips which two horses carried into Boston. I say there is not a single product that can be raised so profitable as that, but that is merely an isolated exception.

I trust that such a degree of attention will be attracted to this subject through the discussions of this Board, that some good result may be achieved. If it can be done anywhere I think it can be done in this State. If we present one solid argument which will strike either the farming community or the city of Boston, the object will be accomplished. What we want is some suggestion that can be carried out. If onions are the crop, if teazles are the crop, or any isolated thing you can mention is the crop, go into it. All I say is, if your crops stop, our ships and our mouths stop.

Mr. Asa Clement, of Dracut. Mr. Slade's remarks upon marketing have interested me, and so have the speeches of others upon the same subject; yet after all which has been said in relation to our own and European markets, gentlemen present will not live to see any very radical changes produced in the modes of marketing here. Why, it seems to me perfectly visionary that any Europeon system of disposing of the products of the soil can by our people be adopted, on account of the habits, manners and customs of our citizens and towns-people generally. Possibly the citizens of Suffolk County would be benefited by the purchase of five acres, more or less, out on the Back Bay, and converting the same into a market place, to which the country people could resort at stated times when they had anything in the line of produce to dispose of to their city friends who chose to meet them there, but under the circumstances as they exist, with our system of railroads and freights, many long years will elapse before any considerable portion of the people can be made to see it in that light.

In Middlesex and Essex Counties the markets are such that the producers may, in the main, convey their products directly to the consumers, and if too much is not demanded, may generally dispose of commodities thus, fixing their own price upon the same. In Lowell, for instance, there are hundreds of widows and others with moderate means, who have gone thither to procure a livelihood, and secure to their children the advantages of the city schools, by keeping boarders on the corporations or elsewhere, few indeed of whom are so conditioned that it would be convenient daily to attend a market; therefore they expect that market-men, and women too, will call at their doors with the things needful, and they do so. It must be confessed, however, that the labor required to sell to advantage any commodity of which there is a superabundance, as was the case with apples in the autumn of 1870, is sometimes onerous, but may as well be submitted to philosophically as otherwise. In the larger cities like Boston, with its thronged and crowded streets, no way to dispense with middle-men is yet clear to my mind, however desirable such a result may appear on its face; still I would resort to any legitimate means to break up monopolies and secure to the producer a fair share of the profits.

Adjourned to evening.

EVENING SESSION.

The Board met at 7½ o'clock, to listen to a lecture on

NEW ENGLAND HOMES,

BY PROFESSOR ALBERT HOPKINS, OF WILLIAMS COLLEGE.

Home is a word which has a definite meaning in New England. It is a word which cannot be defined in dictionaries; yet there is no word the meaning of which is better understood—scarce any more comprehensive word. Certainly, there are few terms of one syllable which enfold and wrap up within themselves so much that is precious.

There was a time in New England, and it was a very good time, when her homes, for the most part, were those of the men who cultivated the soil. Yet, even then, there were other homes; as no profession or calling can be absolutely independent of all others. There was a man who exchanged certain articles, either of luxury or of essential use, for the products of the farm. This was the *merchant*. There was a man who laid cellar walls, and occasionally reared upon those walls an edifice of stone or of brick—the *mason*. Usually, however, this artisan exercised the duties of his office about the chimneys;—not a sinecure office by any means in those days.

The buildings, for the most part, were of substantial wood; demanding the services of the *carpenter*. And because there were "polite people" in those days,—a class, and in our best towns, it must be said, a salutary class, though we eschew and always have done, even before we broke with England, all artificial distinctions of rank,—yet there was a polite class of people, of more than ordinary refinement and culture, who moved in a circle not very exclusive, yet somewhat exclusive; and to whom the mass of the people accorded as a fitting thing, that their equipage and style of moving about should have something more of elegance than they could afford, or than would have been suited to their means. A class of artisans, therefore, was demanded who could construct that wonder of a former age—the high-topped chaise.

I think my memory goes back to the introduction into New England, at least into the rural districts, of the more convenient, though confessedly more plebeian mode of conveyance known as the one-horse wagon. To construct these different styles of vehicle, intended to facilitate locomotion—to render it at once rapid and pleasurable, anticipating unconsciously the cars, which were coming and were soon to arrive, to answer the demands of the people in this direction, the occupation of the *carriage maker* was subdivided. There must be a class of men, wielding rather more delicate tools than adzes, broad-axes and beetles—other implements than those used in the construction of carts, ox-sleds and lumber wagons. Then these wagons must have tires, and the sleighs must have shoes. To supply these necessities and to do a great many other things there must be a *blacksmith*. And because his sledges and tongs and big bellows were too clumsy for certain operations—for mending a lady's finger-ring, for repairing a time-piece, or perhaps constructing one, there must needs be another tradesman. Thus it came about, while every town, of course, had its blacksmith, that those of much pretension boasted also a *goldsmith*.

There were, also, many nice articles of furniture which it was necessary to have, even in the good old times, which by a kind of courtesy we assume or allow to have existed, even before the days when extravagance and luxury had begun their undoing, corrupting work. Stands and tables and sideboards and chairs were indispensable things, before the days of ottomans and lounges and brackets and what-nots. The *cabinet maker*, therefore, claimed and had assigned to him a place.

Another artisan who did not ply his trade in every town, but whose services were still indispensable, was the *stone cutter;* with his chisels and mallets and apparatus for smoothing and polishing our native marbles, in order that we might have white jamb stones and hearth stones and door steps, and in some extreme cases, flagging stones to the front gate ; in order, also, that we might have on our hillsides, or on the plain, some substantial memorials of departed worth—some tablet, sufficiently smooth and sufficiently white, to have engraven upon it a record of what our hearts had cherished and our homes had lost. One of the pleasures and wonders of my childish days was to stand in the shop where good Dougherty, skilled in lettering and in the art of making marble urns, plied his trade.

Then there were the most obvious demands of the body for clothing. And here again, in the fabled days, if they were fabled, when good taste alone regulated the fashions, and when a well-regulated love of beauty, which not the beautiful alone share, but which is a gracious legacy innate in all to some extent, alone ruled in the sphere of ornament, it was found that the *tailor* with his goose, and the *seamstress* with her needle, could not supply every article of outward covering. We talk of a homespun age ; and suppose we know what we are talking about. But the truth is, there never was such an age. Poets tell us of a time,

> "When Adam delved and Eve span,"

but that was a long time ago ; and could we have been privileged to look in upon that prototype of all simplicity—that sample and specimen of a time which antedated so far the extravagances and follies that have since appeared, we should have seen something that indicated to us the distinction between the trade of the tailor and that of a *milliner*.

The men who made our *hats* and our *shoes*, too, especially in these cold climates, must be admitted as representatives of necessary callings. It is obvious, also, that in order to manage our steeds, or sit comfortably upon their backs, or attach them conveniently to our vehicles, we must have leather variously cut and stitched. And, since leather in its crude state is unfit for the various uses to which we apply it, room must be made, not only for the *harness-maker* and *saddler*, but for the *tanner* as well.

Three important callings I have omitted, which cannot properly be called trades. We call them professions—that of the doctor, the lawyer and the minister. Before introducing the professions I should have mentioned the *cooper*, the *tinner* and the *tinker*,—and still another calling, which, to have left out would have been fatal to *all* the rest. For where would our grandfathers and grandmothers have been had it not been for the *miller*.

Now all these trades and professions used to be represented in our goodly New England towns. And, if we except the hatters and the tanners, who seem of late to have localized their trades at points somewhat remote from each other, we still have them all; and it is quite astonishing how numerous they are. I was about to speak of New England homes, and to regard them almost exclusively as the homes of the yeomanry, as farmers' homes. But I was reminded of the store where we used to carry our grain, butter and eggs; and this suggested the storekeeper and the other trades and callings, each asserting its right to live, on the ground that it supplied some human want —artificial wants, perhaps, in some cases, yet wants which belong to civilized man.

The catalogue above given, however, large as it is, and nearly complete as descriptive of the olden time, is still far from being complete as descriptive of our times, which have witnessed an influx of trades and manufactures, of which no one dreamed at the opening of the century. These trades and callings, however, whatever they may be, and however numerous, are all subordinate to that great industry which occupies itself with the soil; which stirs the earth and stimulates it, and adds to its productive power. The man who draws the waxed ends cannot live on the leather he sews; nor he who smiths the anvil, on the iron he welds, and so on to the long chapter of trades and professions. Even the "king himself is served of the field." Whilst, therefore, the homes of New England are the homes of all her people, we must rather look to her country homes—to the homes of those who manage her landed interests and cultivate her soil, as her real *typical homes*. In such homes, those virtues which have made the name of New England honored, have had their root. And the maturity and vigor to which these virtues have attained, has not been due to accidental causes, but to causes as permanent in their action as those which secure the equilibrium of the seasons amidst changeful skies. The generations have changed ; yet, what gave character and worth to them remains. Amidst the fluctuations of the times in trade, in fashion, in politics, there is a substratum of integrity, of loyalty to truth, of industry, of courage, of patient endurance and perseverance, of decision, of enterprise and of hopefulness for the future, based on a prevailing faith in the power of goodness to vindicate itself, in the long run, against whatever opposes and may for a time postpone its triumph. What we have to say is, that from the beginning there have been in New England, homes, and a great many of them, which have turned out just such results, just such moral characteristics as these ; and the natural inference, indeed the necessary inference is, that there must have been at work in these homes some apparatus adapted to the end actually reached ; just as a beautiful piece of cloth from a mill, is an advertisement to the public of the perfection of the machinery of which it is the product.

Now, the elements above named are not physical ; they are moral and religious. But they are elements of mighty weight, in any just estimate, whether of a nation's greatness or of a nation's strength. They do not, indeed, enter into our statistics, which we collect with painstaking, and point to with pride, which we flaunt in the face of our enemies, as a proof of our strength, and a warning to them to keep hands off. The old figure of the lion and the unicorn, with which Britain foolishly thought to intimidate her feeble colonies, we are tempted to borrow and use for a like end. But we all see and know, as well as we know our alphabet, that external resources, however high up they may be piled, constitute not the strength of a nation. Beautiful France, with her great resources, her fertile soil, her climate almost unrivalled, has proved herself not strong of late ; and one secret of her weakness unquestionably is to be found in the fact, that among the thirty millions of her spirited, talented, chivalrous people, so few have known the educating power of a Christian home ; so few have had instilled into them around the hearth stone, those high qualities of the heart, which give stability to the purposes of men, and exalt patriotism to the rank of a religious virtue ; because the State, with its tribunals of justice, and its sword, with which it menaces the evil doers, while it stretches forth the same as an ægis, over them that do well—the State with all its judicial and executive functions, is an ordinance of God. There is a vast difference between the frantic excitement of a mob, crying "Vive la Republique," and that sacred regard for human rights which lies at the basis of all rational liberty. I hesitate not to say, that of all the precious boons conferred by a New England home, none can be named more precious, none as precious for the inmates of those homes, none as precious for the State, as those cardinal virtues above enumerated. These virtues—and what I am about to say will give a glimpse, will, in a measure, unveil the moral machinery already alluded to as so perfect and so potent—these cardinal virtues, claimed as the product of New England homes, *are not learned from books.* They are not caught up at random, by men when they have come to years. They are virtues which impress us as they are seen in the *concrete*—and they come down from fathers and mothers to sons and daughters, because they are positive elements in the character and life of those fathers and mothers. We are made, and benevolently made, creatures of imitation, that we may be prepossessed in favor of virtue through our affections, before our judgments, which are of slower growth, have gathered strength. And there is but one place, by way of eminence, where these prepossessions may be fostered, fed and strengthened. That place, you will agree with me, is home. It isn't where the home of a man is the café, or a bench in the public gardens, or a lounging place around the Tuileries. It isn't where the woman is lost in the doll, and where public amusements and fashionable gayeties engross the interest which ought to cluster around the fireside.

A New England home is a very peculiar institution. I have travelled over the world somewhat; and some of you have travelled much more and farther than I. We have seen a great many wonderful things, and a great many good things, and peculiar things. But very few are the directions, very few, indeed, the points of compass towards which a man or a woman, nurtured around the firesides of our native hills, could move, and not feel that they were retreating from centres of moral light and warmth, towards regions of benumbing cold and darkness. Something analogous might be found in Britain, and at a few points on the continent. But few and far between, if anywhere, would be the spots on our globe, where, laying aside all prejudice and prepossession, there could be found, clustering about the sacred spot which we call home, so much to inspire reverence for what is high and noble, and love for what is generous and self-sacrificing. I know there are those who seem to gloat over the past, and to feel a kind of morbid satisfaction in the belief that our New England homes, in their moral aspects, are deteriorating. If so, the fact must certainly be set down as an argument of no inconsiderable weight, in fact as a triumphant refutation of that supposed law in æsthetics, which assumes that there is between taste and morals a decided and friendly relation. It is not long since the old, brown, unpainted, or in some cases, red farm houses, so common everywhere, were superseded by more pretentious structures, neatly painted in drab or white ; whilst the unsightly fence has yielded to the ornamental hedge, or some tasteful rustic form of enclosure. In place of a few old fashioned lilacs, ornamental shrubs in variety are found dotting the lawn. And the inmates of this new mansion are in some respects more refined, and as a general thing better educated, better informed. More pains has been taken and more expense, a great deal more expense has been incurred to train them to the duties of manhood and womanhood. And though there is, no doubt, in our time a good deal of frivolity, and much money spent upon mere accomplishments ; though our young men might compare unfavorably, perhaps, in point of physical stamina, with those of the past age, and our young women are suffering, no doubt, some of them, because the cold wind and the rough wind have not been suffered to blow enough upon their faces and their hands ; though every age has its drawbacks, and ours, without doubt, has its share, yet I am loth to believe that the old Puritan stock, on the whole, is suffering intellectually or morally.

I was lately invited in one of the hill towns of Berkshire, to open a discussion before the churches, assembled there by their delegates, on the question " What are the gains or losses of the church of the present day, as compared with the past generation ? " And after balancing the " pros and cons " as well as I was able, I could not yield to an inclination, natural to gray hairs, to pronounce the " former times better than these." And in this I was glad to be sustained by my venerable neighbor Dr. Todd, whose writings have found their way into many New England homes, and have served to make them happier and better. And I believe it is good logic to infer that if the church has gained the family cannot have lost.

It would have done this convention good, to have looked out from that meeting-house in the hill country, whose eves on the one side feed the Connecticut, and on the other the Housatonic —a house of goodly proportions, and yet shingled from one pine tree, cut early in this century by the hardy yeomen, and converted into a roof which has weathered the winds of that high outlook, and shed the rains of more than sixty years. The sons of these hardy, industrious, intelligent men were present, to listen to our discussion. Their houses might be seen, nearly half a mile apart, on points sufficiently bleak, leaving us to imagine what work there would be, in a few weeks, on those cross roads. What blinding snow storms and deep drifts, what digging out to get to school and to church, and what filling in to call out again the men and the boys and the teams. Yet those dwellings, sparsely scattered over a high, bleak, windy region, owned by their occupants, and free from incumbrance, within difficult, yet possible reach of the post-office, the school and the church, were homes, if not of affluence, yet of comparative plenty,—homes of intelligence, where the sons and daughters, of a winter's evening, could read together Snow Bound—that beautiful idyl of Whittier, and read it appreciatingly too; appreciating, no doubt, better than some of us, how true to nature are its descriptions of a wild, wintry night in the country.

We might not covet a home so high, so windy, so bleak in the winter, or fields yielding a return so grudgingly to the hand of toil. But if we found under those roofs, as we should, intelligence, a familiar acquaintance with our best authors, if we found young ladies who would recite poetry, yes, and write it, and why not, in sight of Bryant's birthplace, and young men well read in the history of their own and other times, young men, some of them, who have made history by their heroism, if we found in young and old a reverential regard for what is good, and just, and pure, our pity would be turned into envy. We should feel that whilst conveniences, and luxuries, and tasteful arrangements and surroundings, are not to be despised, but rather to be rejoiced in, yet neither these things, nor anything outward, in the way of architectural display—no variety of shrubbery, no statues, or vases or fountains on the lawn, none of these things, nor all of them grouped together can make a New England home. Such a home must have something more than external beauty to recommend it. It must be a household home—not only must the eye be educated to appreciate what is beautiful, the intellect must be quickened by thought and the language improved by conversation and discussion. There must be more than this even. That is not a true home which is not a home of the heart. That cannot be accepted as a model of a New England home, in which the affections are not educated, in which love does not intertwine its living chain between the parent and the child, securing obedience without constraint, and holding each heart true to the great law of kindness. Such a home as this will not have all its blessed things to itself, but will be very apt to send out its good angels, its angels of mercy to the poor, and its apostles, to teach the world that the maxims and the spirit which can make one home happy, are sufficient, if accepted and exercised, to make a world happy—apostles of freedom, of reform, of progress, in every good cause. Such are going forth year by year from the busy hives, where the brain and the heart, the bone and the muscle are being trained in a seminary more important and more potent than any which the State endows. Our colleges and our institutes, our theological and technical schools, may do much to chisel and polish, but if the material which comes to their hands, comes with no preliminary impress from the amenities and sanctities of home, that material can never be wrought by any system of instruction, however well arranged, to the good uses it might have subserved, whether for the individual or for the State.

An old-fashioned New England home, I am reminded here to say, consisted often of many persons, and this element of number added much. It added variety. It exhibited different modifications of that one supreme thing, which we call excellence,—that multiform unity, whose perfection, as a whole, consists in the perfection of all its parts. It was much to have in a family, a Mary and a Jared. But it was more to have a Mary, and a Jared, and an Alvah, and an Elijah, and a Clarissa, and an Isaac, and a Sarah, and a David, and a John, and a Rhoda, and a Nathan, and an Ezekiel, and all these under the regimen of the good old times, growing up to manhood and womanhood, so as to become veritable uncles and aunts. What variety in such a family! Some having an ear for music—leading singers in the choir. One playing on the clarionet, one on the bassoon. One having a taste for mechanics and astronomy, one bound to go to college, one holding the pen of a ready writer, so that when he set his copies in coarse hand, it was difficult to tell whether it was copper-plate or not. One with a turn for horticulture, others devoted to the general culture of the soil, and all made familiar with the wonders of machinery in the old grist-mill belonging to the family,—a mill which helped supply Washington with flour when his army lay at West Point; whose great overshot wheel we children, when we made our visits, used to go and gaze at, to get a sense of power. Such a family was a little state; and such families there are now. I lately saw four young men, with eyes full of intelligence, their hair as black as a raven—devoted to business, yet not so devoted but that one could write a book, and another a scientific article, based mainly on his own observations. Last summer one of them called and wished me to go out to the carriage, where were some of his sisters, beautiful girls, and no questions to be asked. One could see, at a glance, that they were accomplished and good. And how agreeable was my surprise, after seeing all this, to be informed that these were only *samples* of several others, for whom there was not room at that time! What a family. The truth is, it sometimes seems as though there was too much goodness crowded under one roof. There was only one drawback about this last family (I must be honest), and that was that it was not from New England; and another drawback, perhaps in the eyes of some still worse, it was from the city. All I can say on this point is, that probably the family originated in New England, and they show their appreciation for her hills and homes by yielding, as often as they may, to that magic power which the country more and more exerts, and to which the city wisely yields more and more every year.

I must not close this hasty and imperfect dissertation on so fruitful and vital a theme, without drawing one practical inference, which I wish to address to the young men of New England. I would put it in the form of advice—the most important I ever gave, if I could hope it would be heeded, which I fear it will not. My advice then to our young men would be, *to remain at home.* A nation moving on wheels is a nation moving to destruction. We must have homes. Certainly they cannot be surrounded by acres so broad as the farmers in our Western States can boast. But the question of acres, of their number and fertility, is not the main question, as we have seen in connection with the great problem of a home for life. And even in the matter of acres, if we take everything into the account, I am not disposed to yield the palm to the Prairie State or any other State. I travelled somewhat extensively in the West a year or two since, and returned with the conviction that it would be as well for me at least to remain in New England. I would not certainly exchange my farm in White Oaks, for any farm in Illinois, if I had to live on it. I like to hear occasionally the sound of a brook—a brook that has pebbles and makes a noise as it flows. I like to stumble occasionally upon a dell or a glen. I like a farm that has hills on it,—high hills and steep hills, such as used to tempt my feet once,—such as old men look up at, and exclaim with the patriarch, "O that it was with me as in months past," when my feet were "like hinds' feet," and I could walk on those "high places."

But tastes differ, and perhaps it is all well. Let it be then that hills, and dales, and streams, and mountain shadows, are elements not worthy to be taken into the account; what shall we say of those moral elements which have been described? Is it nothing for our affections to have a home? Is it nothing to perpetuate to others that which has made us rich—that which has made our New England homes not only blessings for ourselves, but *model homes* for the continent?

I learn from my friend, President Chadbourne, who has just returned from a tour to the Rocky Mountains, that numbers, taught by that most impressive teacher, experience, are taking new views on the subject of emigration. He met baggagewagons from Oregon headed toward the East! It wouldn't be strange if there should be a second exodus, before many years; from an illusory Canaan, in search of which many a pilgrim has lost a home, towards lands and homes less favored in some respects, towards a climate more rigorous and a soil less fertile, yet to a region which, taking all things into account, the physical imperfections, which cannot be escaped anywhere on this planet, and those elements, intellectual, moral, social and spiritual, which give to life its substantial value, and which, when withdrawn, render life, to say the least, a questionable boon,—taking all things into the account, a region as desirable as any other, whether to live in or to die in—to live in and to die in—this is what our homes are given us for. We would wish them less transient, more permanent. We feel as the wise man felt when he made great works, builded houses, planted vineyards—when he made gardens, and orchards, and planted them with all manner of fruits, and pools of water, to water therewith the wood, that bringeth forth trees; he felt it to be "a great evil" that he must leave it all so soon. This is, no doubt, "a sore evil," yet it is the law, by Heaven's decree, to which our homes and our estates are subject. And there is this alleviation in the case,—that what our lives are too short to perfect, and fully to enjoy, may be perfected and perhaps more fully enjoyed by others; so that we may work with good courage, each adding his mite of influence to make home what it probably will be in the good time to come—more attractive and beautiful in its surroundings, and the centre of a higher intellectual and moral life, than it is in this progressive, yet confessedly imperfect time in which we live.

THIRD DAY.

Thursday, Dec. 15, 1870.

The Board met at nine o'clock, with Col. Eliphalet Stone, of Dedham, in the chair. The following lecture was delivered upon —

MANURES, GENERAL AND SPECIAL.

BY DR. JAMES R. NICHOLS.

In commencing a series of farm experiments in 1863, with the view of deciding, for my own satisfaction and that of others, some controverted points regarded as of much importance to the interests of husbandry, it was felt that no satisfactory results could be reached in less period of time than four or five years. The matter of *time* in all farm experiments, in my view, was of the highest importance, and therefore it was resolved to make no extended statements or venture upon any conclusions until the experiments had been carried through several successive seasons.

It is now nearly or quite seven years since a purchase was made of a farm of about one hundred acres in Haverhill, county of Essex, and upon which there has been bestowed considerable attention and some trials made of fertilizing agents of various kinds, and under ordinary and extraordinary conditions. I have thought that perhaps I could in no better way bring the important subject of *Manures, general and special*, before you than to call attention to the nature and results of a few farm experiments, those relating more specifically to manurial agents outside of animal excrement.

So far as I could learn, there were some interesting problems in agriculture which had never been satisfactorily solved in New England, or, in fact, in no section of our country. It seemed desirable and important for the interests of husbandry to ascertain, approximately at least, by careful and extended experiment the value of special or chemical fertilizing agents upon our New England soils, and in order to test this matter satisfactorily, it was clear that the experiments must be conducted upon a scale of considerable magnitude. If it was proved that a neglected, exhausted farm, embracing a variety of soils, with uplands and lowlands, could be brought into fair tilth by the use of special agents, it would serve as an important fact in the history of our agricultural industry; and further, if it could be done at a cost which would prove it to be practicable and remunerative, certainly great service would be conferred upon our farming interests.

The farm which I purchased seven years since was not what might be considered a worthless or barren tract, for some portions of it, a quarter of a century ago, were probably in fair condition, producing crops of hay and grain corresponding with those grown by the farmers of that period. For a long time, however, it had been in the hands of those who treated it with neglect, and the best fields had hardly been turned over with a plough, or cheered with a dressing of manure for a score of years. It had therefore become in a great measure exhausted, and the thin grasses suffering for aliment. The number of acres not devoted to wood and pasturing was about twenty-five; of this, nearly one-half was a low, boggy meadow upon which water was allowed to rest until it was removed by evaporation late in the spring. The remainder consisted of a series of elevations or hills of considerable altitude, dry and silicious upon the tops, but moist at the bases from retained water and from springs. The soil of the different fields afforded quite a variety in character and composition, and probably as fairly represented the varying nature of our Massachusetts farms as any tract of land in the State. A portion was silicious, loose and dry; another was loamy and retentive; another, moist and composed of dark mould with a clayey sub-soil; and still another, a well-formed wet peat bog.

It will be seen from this brief description that the farm was made up of fields eminently suited for fair experiment, and also it will be understood that it came into my hands under the most favorable conditions to test the value of any plan or system of fertilization. In 1863, about ten tons of indifferent upland hay was cut upon the portion embraced in the original purchase; the produce of an adjoining field of four acres of upland, which has since been purchased and added to the farm, I am unable to state. No corn or other grain in any amount had been grown for perhaps ten years upon the farm, and I have no knowledge of the character of any cereals produced prior to the purchase. It should be stated here that the chemical analysis of soils taken from the different fields presented a singular difference in composition, and what I learned in this regard upon my own fields led me to examine those of others at comparatively remote points, and the same remarkable variations have been generally found to prevail. The soil at the base of a small hill or elevation is of a very different character from that at the apex, and a level flat at one extremity of a farm is quite unlike another which is at the opposite. It is not necessary for us, gentlemen, to leave our own farms to find soils presenting striking dissimilarities in chemical composition as well as in physical characteristics. This is a point which should receive more consideration in the conduct of our farms.

With the design of attempting to bring this farm into good condition without the use of barnyard or stable dung, no stock was kept upon the premises save a cow and a heifer the first two years, and with the exception of a few loads of manure purchased for garden uses at the start, no excrementitious products have been bought during the seven years it has been in my hands. The farm at the present time sustains eighteen cows, five horses, three hogs, and for a portion of the year, one yoke of oxen. The product of hay the past season was fifty tons, corn, two hundred bushels, rye, perhaps twenty bushels, with large quantities of apples, grapes and other fruits. The productive capabilities of the fields have been aroused through the agency of fertilizing substances outside of animal excrement, and the farm placed in position to maintain its good tilth by the manurial products which it is now capable of supplying. To state the matter explicitly, and thus avoid the possibility of any misunderstanding, the farm was raised from its unproductive condition during the first three or five years of the experiment, by special fertilizers, so that by increase of products it has been made capable of sustaining a herd of animals, which animals now supply all the fertilizing material needed, and the manufacture and use of chemical fertilizers have been in a large measure suspended. In short, the experiment has practically come to an end through its perfect success.

In bringing about these results, fifteen tons of bones, one hundred bushels of unleached ashes, four tons of fish pomace, two tons of Peruvian guano, five hundred pounds of crude potash, one ton of oil of vitirol, ten casks of lime, and several hundred pounds altogether of sulphate of magnesia, nitrates of soda and potassa, chloride of sodium, oxide of manganese, sulphate of iron, sulphate of ammonia, &c., have been employed. Eight tons of the bones have been made on the farm into what is known as "Superphosphate," by dissolving them in the condition of fine powder in oil of vitriol, three tons have been combined with unleached wood ashes, and the remaining four tons have been used in various ways, one portion in the raw or natural condition, another by rotting in contact with moist soil or peat, another for obtaining phosphoric acid, and in other forms for experimental purposes.

The other agents have been employed alone and in such combinations as was demanded to conduct the experiments understandingly, and in accordance with correct scientific deductions. I regret that time and space will not allow of a detailed account of the results of these experiments, as they are certainly interesting and instructive. The statement presented is a general one, given for the purpose of affording a comprehensive idea of the extent and nature of the labors undertaken, and as preparatory to the presentation of the details of a few experiments of a more special character. During the past three years, attention has been given to the production, saving and application to the soil of animal excrements, and these observations ought not to pass unnoticed.

The cost of the bones and most of the other agents used upon the farm was less than they could be obtained at the present time, as they were purchased during the years of great depression which existed in the time of the war. Twelve tons of raw, unground bones were purchased at the start, at a cost of only twelve dollars per ton. They were placed in a large steam-boiler, constructed of iron, and submitted to the action of high-pressure steam for a period of twelve hours. They were then removed, allowed to cool, and immediately reduced to a powder by grinding in a machine resembling a common burr-mill. Bones by steaming are changed in their physical structure, the animal portion or the gelatine, is in part removed, and the cell-structure, before tough and refractory, becomes brittle, and is readily broken up by grinding. After steaming they can be ground in an ordinary plaster mill without obstructing the movements of the stones, and without requiring a greater expenditure of power than is needed to grind common gypsum. The only mill ever constructed, so far as I am informed, that will grind raw or unsteamed bones fine enough for agricultural uses, is what is known as the atmospheric centrifugal machine, which does its giant work by the simple power of attrition. The fragments of bone are allowed to fall into a strong iron drum, which is made to revolve with immense velocity, and by the action of air and of the fragments upon themselves, they are instantly reduced to an impalpable powder.

The rich nitrogenous principle of the bones used upon my farm, the gelatine, was secured and composted with dry peat and bone dust, and this was found to afford a most efficient top dressing for grass lands. Thus, in the process of steaming nothing was lost. The cost of preparation was about equal to the original cost of the bones, and hence I have estimated it at twenty-five dollars the ton. The present market price of bone dust is sixty dollars the ton, which affords a wide margin between the expense of my bone material and that obtained through commercial channels. The unground bone material can now be bought for about twenty dollars, and it can be ground for ten dollars. Why do our bone grinders persist in charging one hundred per cent. profit upon this most important fertilizing agent? We need a reform, and are we not prepared to say we *will* have a reform in this matter of exorbitant prices for commercial fertilizers?

The whole sum expended for special fertilizers during the past seven years, is seven hundred and ninety dollars, or, in round numbers, eight hundred dollars, which, applied to twenty-five acres of land, gives as the cost of renovation, about thirty-three dollars per acre. The price of fair stable manure in the city of Haverhill has, during the past seven years, ruled at about six dollars the cord. Add to this the cost of loading and hauling to the farm, about four dollars, and we have, as the entire cost of stable manure in the field, ten dollars the cord. Eight hundred dollars, the sum expended for special agents, would have provided me with about eighty cords of ordinary long manure. This would have given to each acre a little more than three cords; and now the question arises, could I have secured, by the expenditure of eight hundred dollars for stable manure, fertilizing effects of equal value with those afforded by the plan of treatment pursued, costing the same? I think not. I am confident that to have started my farm and put my fields, by purchased manure, in the high tilth in which they are at present, it would have cost perhaps double the sum which has been expended.

The amounts and cost statements presented are not exact, but sufficiently so to answer all the purposes of this discussion.

Of course, in contrasting the cost of fertilizers, a great many little things should be taken into account. The difficulty and cost of placing bulky manure upon swampy lands and high elevations must not be overlooked, and the expense of handling or distributing it after it is deposited is considerable. Nearly one-third of my tillage lands are so low they cannot be entered upon by any vehicle drawn by oxen or horses, and consequently, it is extremely difficult or well-nigh impossible to distribute heavy manures upon these fields. With the concentrated fertilizers employed, the men have been able to carry in a farm basket an amount of plant nutriment equal in value to that found in a cartload of animal excrement.

Upon my reclaimed meadows no farm dung has been used, excepting on a small patch for the purpose of experiment, and I have secured large crops of redtop and timothy during the past five years. The method of treatment has been varied with the view of ascertaining the best way of bringing them into condition to produce upland grasses. I have dressed certain parcels with the farm-made superphosphate, with a mixture of bone and ashes, with guano, fish pomace, combinations of salt and lime, and with sulphate of ammonia and nitrate of soda. It must be remembered that my lowlands are pure peat bogs, of such a nature, if the water was withdrawn and the deposits allowed to become dry, fire would consume the whole to ashes. The elevation of the bog above the level of Lake Kenoza, upon which it borders, is only nine inches in the winter and spring, when the lake is at its highest altitude; consequently, it is an unpromising and difficult field upon which to experiment with the view of driving out worthless meadow grasses. Indeed, no one in whose judgment I placed confidence would afford me any encouragement to expect success. It was regarded as impossible to renovate meadows which for so large a part of the year were almost submerged, and which could not be drained. Nevertheless, the experiment has proved successful, and crops already secured have paid all the expenses of renovation and treatment. Upon two acres of the six which are now producing upland grasses, a coating of sand three inches in thickness was placed, after thorough spading and pulverizing the bog; upon this, a dressing made of equal parts of fine bone and ashes, two thousand pounds in quantity, was evenly distributed, and it was then seeded down with redtop and timothy, covered in with a brush harrow. The work was done in the months of August and September, 1866. The first crop of hay in 1867 was a little rising one and a half tons to the acre, the succeeding crop was two and a half tons, and those which have since been taken from the field have averaged about the same amount. The present autumn a light top-dressing of farmyard dung has been given the field, with the view of observing its effects. Meadow grasses have not yet made their appearance to any extent. After removing the crop next season, a new seeding will be given the field, and the experiment continued. One acre of the remaining six, received no coating of sand, but after digging out the hassocks and burning them, the patch was turned over with a spade, fertilized with three hundred pounds of bone dust and two hundred of guano, and seeded down similar to the other. This was accomplished in the autumn of 1868. In 1869 the first crop and aftermath gave three tons to the acre. The present season, the two crops have exceeded that amount. Another acre bordering directly upon the lake, but slightly more elevated, was reclaimed in the same manner in 1867, and treated with one ton of dry fish pomace. It gave a crop the succeeding year of one and a half tons to the acre, and since, the yield has been about two tons each season. In 1869, two more acres were put in condition, fertilizing one-half with pure bone and spent ashes, the other with farm superphosphate. The crop this season upon both sections has been nearly alike, slightly exceeding one and a half tons to the acre. The remainder has been seeded down the present autumn, using upon one portion farm dung, upon another lime, upon two other portions various combinations of salts, which it is needless to mention, as no results have yet been reached. Some of these experiments have been continued long enough to learn something of the value of the methods of treatment, while the others have not. Several plats of the meadow have been put in condition, and left one season without any fertilizing agents, and the result has been, that ferns and coarse meadow plants have flourished together in rank luxuriance, thus proving the needed presence and high utility of the plant stimulants employed.

I think from the brief and imperfect statements presented, it will be conceded that wet peat meadows can be profitably reclaimed and fertilized by special or concentrated agents, easy and convenient to handle. I shall not venture upon the expression of opinions at present regarding the most effective and cheapest agents, as these points are not satisfactorily settled. After a few more seasons have passed, I shall have results which will enable me to form a more exact and reliable judgment in regard to the matter. The great value of our lowlands in Massachusetts, is as yet imperfectly understood, although attention has been called to them persistently through books and the agricultural press. Farmers, as a general rule, fear to have anything to do with the soft peat bogs so common throughout the State. Their experience in miring oxen and horses in attempts to plough or haul on manure is not favorable to the prosecution of the work of renovation. When it is known that the spade will do the work of the plough and that fertilizers of great efficiency can be carried in a basket upon the shoulder, a little more courage may possibly be infused into the owners of such lands, and they may seek to draw from them their hidden wealth by the work of reclamation. It must, however, be distinctly understood, that all meadows are not of a character to pay for any labor that may be bestowed upon them. It is important that every farmer should carefully examine his low grounds before commencing improvements, that he may not subject himself to disappointment and loss. It is certainly difficult to clearly describe a meadow which will not, after working, bear good crops of sweet grasses, but I am confident I could point out such, if allowed five minutes' work upon it with a spade. A piece of low land deficient in peat, with a superficial clayey covering, overrun with moss or short, matted grass, will not pay for the labor of renovation; neither will a meadow pay which is surrounded with a forest which places it in shade half the hours of the day, no matter what may be the nature of the deposit. A meadow permanently wet, and which cannot be drained, is one upon which labor is usually wholly lost. Any low land open to the air and sunlight, and which has a good bottom of peat or black mould, and which is raised one foot above the highest water level in the spring, can be converted into a profitable field, yielding abundance of the nutritious grasses. More attention should be bestowed upon such lands, as the hay crop is one of the most important and profitable of any produced upon our farms.

A series of extended and systematic experiments have been undertaken upon my farm in connection with fields which are elevated and dry, and which were unproductive at the time they were commenced. Let me call attention to a single one of these. A measured acre of land of this nature was ploughed in the autumn of 1863, and in the succeeding spring dressed with five hundred pounds of pure, fine bone, sown broadcast, and then planted with corn, a handful of farm-made superphosphate being placed in each hill. One hundred and fifty-seven bushels of corn in the ear were taken from the field in the autumn of 1864. After the corn was removed the land was ploughed and again dressed with eight hundred pounds of a mixture consisting of ashes, bone dust and refuse saltpetre, and sowed down to winter rye and seeded with timothy. The crop was thirty-one bushels of nice, plump grain. The season of 1866 was exceedingly dry, and the tender grass roots were so parched with heat, that the hay crop was cut short materially. The product of this field was only twenty-three hundred pounds. The next season a top-dressing was given it of five hundred pounds of a compost of gelatine and peat (the gelatine being the liquid or resultant product coming from the steaming of bones), and the hay crop reached forty-three hundred pounds. The crop of 1868, with the aftermath, reached two and a half tons. That of 1869, after a top-dressing of two hundred pounds of Peruvian guano, was two and a quarter tons. The present season it was a little less than two tons. In this experiment, a dry field, originally exhausted, has been treated exclusively with concentrated fertilizers, and carried over a period of seven years, the seasons embracing the extremes of dry and wet, and these are the results. Are they satisfactory, or is the experiment a successful one?

The corn crop, seventy-eight bushels of shelled corn to the acre, is not bad; the rye crop, thirty-one bushels, would not be disappointing to most farmers; and the succeeding crops of hay, amounting in the five consecutive years to nearly ten tons, are certainly a fair product for high land, subject to unfavorable influence of drought. The cash value of the crops at the farm from the acre, if they had been sold at the time they were gathered, would have reached fully four hundred dollars. But it should be stated that corn in 1864 was worth two dollars and fifty cents the bushel, and all the crops have ruled high since. The cost of the fertilizing agents employed has been a little over forty-four dollars; the cost of labor cannot be exactly stated, but it is certain the field has afforded a clean profit of one hundred per cent. each year.

I fear to weary you with the details of other experiments undertaken on the farm, as perhaps enough has been said to convey a general idea of the nature and design of the work. It is worth something to know that a run-down farm can be in a fair measure rejuvenated and made productive by a class of manurial agents which do not partake of the nature of animal excrement. It is worth much to know that these agents are proved capable of exerting a *sustaining* influence upon our soils, that these fertilizing effects are felt year after year, and that crops do not rapidly falter when they can draw nutriment from no other sources. I think we have learned that remunerative crop returns are possible and probable when special fertilizing agents are employed in their highest integrity, and when a fair profit only is paid in the purchase of the raw materials. Before passing to the consideration of another topic incident to this discussion, I will briefly allude to the grain crops produced upon my farm.

A crop of corn has been raised each season since 1864, and also a crop of spring wheat until the present year. Rye, oats, roots and potatoes, with the various grasses, complete the list. From careful records of expenses and results, I find the corn crop to have been the most remunerative, and the wheat comes next. During the seven consecutive seasons closing in 1870, we have passed through great vicissitudes of meteorological changes; we have had seasons characterized by extreme wet and unparalleled heat and drought, some have been quite extended and others have been very brief. That of 1869 gave us only about one hundred days in which to plant and harvest our corn; the past has been of extraordinary length, the warm growing weather lasting from early in April to November. It has been a period of great value to those who wish to gain by experiment and observation a knowledge of the best methods of farming under the extremes of heat and cold, wet and dry, and of the crops best suited to our capricious climate. The farmer who by imperfect tillage and lazy habits, has reached the conclusion that we in New England have no certain crops, is indulging in grievous error. All our cereal and grass crops are certain enough if our fields are in perfect condition, but corn may be said to never fail if a reasonable amount of attention is given it. My crop has never fallen below seventy bushels of shelled corn to the acre, and in 1869 I grew in about one hundred days a crop of *one hundred and six bushels to the acre.* So late was this season that I was able to walk across the ice-bound lake upon which my fields border on the 10th of April, and snow rested on my potato patch the 2d day of May. Corn among crops with us in Massachusetts, is like a Bronsonian democrat, it rises "superior to its accidents." The crop at Lakeside the present season, hot and parched as it has been, has reached seventy-five bushels to the acre. The cost of the corn in the aggregate, raised during the seven seasons, does not exceed forty-five cents per bushel. In this estimate we include one-half the cost of the fertilizers and all the labor from the time of planting to shelling, but it *does not* take into account the fodder which has proved in my experience to have a high value. This has been fed to milch cows in association with wheat straw in the long and cut condition, and careful observation and experiment show that it is worth nearly as much, as a milk-producing agent, as upland hay. Corn, gentlemen, is the cereal to which we should give special attention. To grow it profitably we must grow *large quantities on small parcels of ground.* It requires no greater expense for labor to raise seventy-five to one hundred bushels to the acre, than to raise twenty-five. Corn can be grown in good quantity for several consecutive years upon the same field by the use of agents which hold those great essentials to plant-growth,—phosphoric acid, potash and lime; but to attain to the highest success, substances capable of affording the nitrogenous element must be added. The first three years of my experiments with the corn crop, I depended solely upon dressings composed of lime, potash or ashes, and flour of bone, and my crops were excellent, but I now use in association four cords of good fresh farm dung to the acre, spread over the ploughed field and harrowed in with a Geddes harrow. Into the hills at the time of planting, I place a handful of a mixture of fine bone and ashes, and under this treatment, I have learned to anticipate heavy crops with full confidence. For corn, or indeed, for any crop, I prefer to plough in the autumn. One of the most important items to be taken into account in the cultivation of the soil is the fineness of the mould in which the seed is placed. A hard, lumpy, imperfectly pulverized field, holding equal amounts of the elements of plant nutrition with one that is fine, will fall short usually twenty per cent. in product under the same meteorological conditions. In fall ploughing we secure the disintegrating influence of frost upon our furrows, and this is costless aid in soil cultivation. There are other advantages which I will not stop to enumerate.

For five consecutive years I have not failed under what I regard as proper soil treatment to secure good crops of wheat. In one season, that of 1867, it fell to twenty-one bushels to the acre, but the others have not gone below thirty. It was, indeed, singular to find what a strong prejudice existed among farmers, against attempts to raise this noble grain. It was urged that it could not be grown on our soils, they were worn out, did not hold lime or something else necessary to its development; and further, if it did grow, rust, mildew or insects would destroy the crop before maturity. The first year, I startled a neighbor by growing a crop of plump wheat, thirty-one bushels to the acre, while over the fence he grew a crop of barley, fifteen bushels to the acre. I sold my wheat at $3.50, while his barley went for $1.40 per bushel. The plan of soil treatment has been to sow broadcast early in the season five hundred pounds of farm superphosphate to the acre, mixed with one hundred pounds of crude nitrate of potassa, or one hundred and fifty pounds of nitrate of soda and fifty pounds of sulphate of magnesia. The importance of magnesia in the ash of wheat has been strangely overlooked by chemists and by experimenters, and I regard the employment of a salt holding this element, in dressings for wheat land, as of great utility. Nearly one-eighth of the ash of wheat is made up of magnesia, and as our granitic New England soils cannot well supply it, we must furnish it in our manures. As regards the evil influence of rust upon wheat, I am inclined to the opinion that a well-fed, vigorous plant possesses a power of resistance to parasitic growths, which is in a considerable degree protective. I do not mean to say that the farmer can positively and always place himself beyond the reach of disasters, resulting from fungoid plants or destructive weather influences ; but I do say, that a good, vigorous, well-fed stalk of wheat, corn or other grain, will bear up under and resist adverse influences better than one that is half starved and weakly. The battle is in favor of the strong and against the weak among plants, as well as among men and animals.

I do not think it is necessary for me to repeat what I said in an address delivered before the Massachusetts Board of Agriculture at Salem, in 1868, respecting the importance of farmers preparing their own fertilizers, or of securing them in some way in a condition of integrity. After three years' further experience, I have but little additional advice to give. I deeply regret, however, that many perhaps well meaning but poorly informed writers in our agricultural papers, and speakers at agricultural meetings, should make statements and give expression to views which tend directly to lead farmers astray, and to confuse and perplex them upon the subject of fertilizers, greatly to their detriment. There really seems to be no need for this. There are those unquestionably who must write and talk continuously, as this propensity with some often amounts to a disease ; but let us open wide the gates, and drive them, if possible, from the field of agriculture into that of politics, a field where gabblers are harmless, as no one is expected to believe any statements made.

Unfortunately absurd and erroneous statements and strange exhibitions of selfishness connected with agricultural matters do not come from and are not alone confined to those who are among the ignorant and the obscure ; we have had some sad examples from the opposite class. It is only about a year since that a gentleman intimately connected with the interests of agriculture delivered and published an address upon special fertilizers, in which he deliberately advises farmers to abstain from any attempts to prepare their own superphosphate, assuring them that they cannot successfully accomplish the work. In another part of the same address, he informs them that he himself is engaged in the manufacture of superphosphate upon a large scale, and the inference is, that farmers should buy his *honest* products. As we looked through this address, or advertising circular, we could not help exclaiming, "Alas! upon whom can the farmer depend? If interest and avarice confront him, when moving within the circle of those who should be safe advisers and trusty friends, to whom can he flee for counsel and protection?"

It is not alone in regard to the nature and methods of making and applying fertilizers that farmers are led into error; but perhaps there is no subject upon which it is more important that correct knowledge should be disseminated than this. One of the best known and most widely circulated of our agricultural journals not long since advised farmers to collect large quantities of bones, reduce them to fragments by pounding, and then dissolve them by pouring on sulphuric acid; also the same wise advice was given by several speakers at a meeting of the New York Farmers' Club, not long since. Now, it would seem that every intelligent person ought to know that raw unground bones *cannot* be dissolved in sulphuric acid. Whoever recommends this course, purposely misleads, or else is in ignorance from never having tried the experiment. Fragments no larger than a raisin, may remain in strong or dilute acid for months, and not be perceptibly acted upon. They are only attacked upon the surface when in contact with oil of vitroil, and a film of insoluble sulphate of lime is formed which effectually arrests further action. In order to dissolve bones and fit them for plant nutriment, they must first be ground to fine powder, and the finer the better, as the acid can then cut through the little atoms and disintegrate the structure. We must not mislead or be misled in this matter. If a farmer has a quantity of raw bones which have been picked up, it is probable they cannot be ground in any mill within his reach, and he cannot dissolve them in acid. His best plan is to dissolve them by either packing in good wood ashes after the method which has been often described, and which I presume is well understood, or burn them to whiteness, and then have them ground in a plaster mill. Bones piled in a heap with wood, will ignite and burn with great fierceness. The calcined product is brittle and can easily be ground, and the powder, dissolved in acid, forms an excellent superphosphate.

It seems to be necessary to state again and again, that in order to obtain from bones the full fertilizing influence they are capable of affording, they must be reduced to an impalpable powder, that it is a waste to sow upon fields bones which are simply crushed into fragments, so as to be seen readily by the eye. In 1864, I sowed upon a field a bushel of bone fragments, none of them larger than a pea or bean, and the past summer upon turning over the field with the plough, they were brought to the surface entirely unchanged. Ordinary soil and atmospheric influences will not disintegrate and render available, as plant food, bones in the whole or crushed condition during the lifetime of any farmer, though he may live far beyond the common age of man. This important truth should be understood by all who desire to use bones in connection with their crops.

In the renovation of my farm by the employment of special fertilizers, I have kept a few prominent well established facts and principles in view, and have never allowed myself to be diverted, turned aside or confused, by any apparently conflicting statements or alleged results on the part of others.

A truth is a truth, a fact is a fact, no matter how difficult it may sometimes be to compel all agencies and influences to contribute to the establishment of verities. I believe we have some truths, some facts in agriculture, although the contrary view ought to prevail, if the contradictory opinions and statements of many of its professed friends are entitled to regard. Chemistry is an exact science ; it is based on the retort, the balance and mathematics ; and when its aid is called in to inform us regarding the constitution of plant structures, its teachings are infallible.

We can no more escape from its demonstrated facts in this department, than we can from a belief in those applied principles, which enable us to produce, in our industrial laboratories, the wonderful and complex bodies which contribute so essentially to the welfare and comfort of the race. Chemistry has never rendered and never will render such aid to agriculture as will direct the farmer how to raise crops without the expenditure of time and labor, and the exercise of a reasonable amount of skill and common sense ; but it does inform him precisely regarding the nature of the plant structures he is called upon to rear and the food they demand, and this knowledge is of immense service. Chemistry, in its practical hints and teachings to agriculturists, leaves a void which must be filled up by inferences and by the exercise of the ingenuity and the judgment, and any farmer who is incapable of exercising these desirable faculties can never be greatly benefited in his labors by science.

Since 1866, the cash receipts arising from sales of produce from my farm have been steadily increasing. The amount reached during the past year (1869), as shown from the farm books, was $2,458.30, and this year, ending in January, the sum will be considerably larger. The amount paid out for labor, seeds, tools, with interest on cost of farm, taxes, &c., very nearly balances this amount. During the time it has been in my hands important improvements have been made, which have probably doubled its cash value. These improvements have been carried on in connection with the farm work, and but little additional labor has been called in to assist the regular employés. I have usually employed but one man during the entire year, who acts as superintendent, and he is assisted in the spring, summer and autumn, by two others. With a multiplicity of other and exacting labors and cares upon my hands, the affairs of the farm have been managed at a disadvantage, so far as personal labor and oversight is concerned, and this must be considered in estimating the value of the results attained. I have reason to believe that the cash returns from milk, grain, stock, fruits, &c., sold this year will reach to nearly or quite three thousand dollars, which, under all the disadvantages of hired labor and limited personal supervision, may perhaps be regarded as quite satisfactory. Is farming profitable in New England? or to modify the inquiry somewhat, so as to render it more important and interesting, Can farming be conducted in New England so as to be profitable? Let us examine this question in the light of the experience we have had, and which has been very imperfectly set forth in the remarks here presented.

The old adage "What has once been done can be done again," suggests itself to the mind, and if it is universally true, every soil cultivator ought to be able to accomplish what has been done by another. If these results are satisfactory, and if every one can reach the same or accomplish as much, then farming as an industrial pursuit in New England is fairly remunerative and satisfactory. If a farm of one hundred acres in poor condition can by the aid of special and chemical fertilizers be renovated and made to support in seven years a sufficiency of stock so that the resulting excrement will fully maintain its fertility, and if two or three thousand dollars' worth of products can be sold, then farming is a fair business. But it is not invariably true, gentlemen, that what one has accomplished, all others will or can accomplish, for there are certain hinderances and disturbing influences which do come in and modify experiments and labors, undertaken under apparently similar conditions and circumstances. But I am certain that when the untoward or modifying influences are clearly understood and intelligently combated, the variation in the results of different experimenters will be practically of little account.

The hinderances to success in the use of special fertilizing agents upon the farm are not numerous, but they are of a nature peculiarly provoking, and perhaps in some degree discouraging. The greatest of these are connected with the sources of supply, and it is in this direction that we must bend all our energies to bring about a salutary reform. I am free to say that in the farm experiments undertaken, an advantage has resulted from being able to secure and employ only such agents as were of absolute integrity, and also my professional pursuits naturally tend to afford a facility and accuracy of manipulation, which can hardly be expected of most of those in the pursuits of husbandry. Still, the great obstacle to success in the use of special fertilizers lies in their sophistication and general worthlessness. It is not alone in the so-called "superphosphate" that frauds are practised, but deceptions, attenuations and admixtures are practised in connection with almost all agents which science and experience have pointed out as sources of plant nutriment. A certain class of substances which have hitherto passed almost unsuspected and unchallenged through the channels of trade, can manifestly no longer remain above suspicion. Unleached wood ashes, when pure, are of the highest service to farmers and gardeners, and they are diligently sought for by almost every one who has lands to till. Specimens of dry ashes, sold as those of wood, have recently been brought to me, which upon chemical examination were found to be composed of more than fifty per cent. of coal ashes. A schooner load of ashes brought from an eastern port, and purchased by a friend at twenty-five cents a bushel, proved to have only an actual value of five cents a bushel. Analysis of a specimen of these ashes was made, with a view of purchasing a quantity if they proved satisfactory. The examination gave the following result:—

Hydrate of lime,	55 parts.
Silica,	13 "
Charcoal,	7 "
Ashes, mixture of wood and coal,	25 "
	100 parts.

The large percentage of lime is due to the fact, that the ashes came from a limestone district, and were taken from lime-kilns, probably.

Another substance known as "fish guano" or "fish pomace" has acquired considerable reputation in this section as a fertilizing agent, especially for grass lands. It consists of the dry residuum of the fish-oil factories on the New England coast, and is made up of the crushed bones and integuments of fishes, from which the oil has been separated by great pressure. When pure and dry we have found it to be a good and convenient plant stimulant, and worth about twenty dollars a ton. Probably but few of those who have become purchasers of this substance have suspected that it is often so largely adulterated as to be comparatively worthless. Some specimens found in the market, and probably sold extensively to farmers, upon analysis gave the following results:—

Water,	17.26
Sand,	46.00
Phosphate of lime,	8.90
Organic matter holding ammonia and salts of potash, soda, etc.,	27.84
	100.00

Here we have *sixty-three* per cent. of *sand and water*, which are worthless materials, and which are paid for at the rate of twenty or twenty-five dollars a ton.

Another specimen gave:—

Water,	31.00
Organic matter,	35.00
Phosphate of lime and various salts with sand,	34.00
	100.00

This is better, but still *one-third* of the whole bulk is perfectly worthless. A popular "superphosphate" recently examined, gave twenty-two per cent. of water and only five and one-half per cent. of soluble phosphate. The fact that husbandmen are not generally competent to judge of the value of compounds offered as fertilizers, has led to placing on sale some of the most absurd substances and mixtures which human ingenuity can discover or devise.

A heavy powder called the Grafton Mineral Fertilizer has come into the market within a year or two, and has secured a large sale at high prices. What is the nature of this powder? Let us judge of it by the analysis which is presented in connection with its sale. Here it is:—

Silica,	30.3
Protoxide of iron,	6.27
Lime,	20.6
Magnesia,	11.17
Carbonic acid,	32.11

This statement gives 30 per cent. sand, a small quantity of iron, and the remainder is carbonate of lime and magnesia. One-third (the sand), it is plain to see, is worthless; the iron is of no account, as every soil in New England furnishes from the decomposition of the sulphurets an abundant supply; the carbonates of lime and magnesia are worth something, but how much? little more than ground oyster or clam shells. I would hardly give five dollars a ton for this insoluble, unassimilable powder delivered at my farm. In fact, I should not want it at any price.

I make these remarks in the interest of agriculture solely. I do not know the names of the parties who grind the rock or vend the powder. In justice to them, it should be said, that they do not appear to sell it under any false statements as to its chemical composition ; the evil consists in holding it as a fertilizing substance of large commercial value.

A concentrated liquid fertilizer put up in stone jugs, each holding a quart, for which the modest sum of two dollars and fifty cents is charged, has been, I am informed, largely sold in many sections of the country. This is indeed carrying the joke too far. France, it is said, sends us these concentrated plant bitters, and I am tempted to say that any people engaged in such charlatanry ought to be destroyed by the Prussians, or by their victims, the Americans. Mr. Dodge Haywood presents us with a compound he is willing to supply at $27 the ton, which is not so ingenious and original in composition, as the published analysis is intricate and formidable. He makes us acquainted with its composition in the following analysis :—

Aqua and organic matter,	10.40
Carbonic acid,	3.30
Oxide calcium,	24.20
Phosphorus,	1.00
Soda,	12.00
Chlorine,	10.10
Sulphuric acid,	30.00
Oxide of iron,	.60
Silex,	8.40
	100.00

Plainly stated this is the mixture :—

Moist muck,	10	lbs.	cost	$0.00
Gypsum,	45	"	"	0.20
Salt,	22	"	"	0.10
Carbonate and phosphate of lime,	15	"	"	0.18
Sand,	8	"	"	0.00
	100	lbs.	cost	$0.48

If it were desirable to make this compound, a ton would cost about ten dollars. It is easy to prepare composts better than this, and not more costly.

In view of what we know of the nature of commercial fertilizing agents, is it necessary to inquire why so small an amount of benefit is received from the application to our lands of these substances? When a farmer purchases and employs, in connection with his crops, fertilizers of unknown value, pray tell me of what value are his experiments to himself or anybody else? If he fails of satisfactory results, upon what or upon whom can he lay the blame? If he secures a successful crop, does he know whether it is due to the fertilizer or to a favorable season, or good culture, or some other agency? He certainly can form no satisfactory opinion upon the subject.

How can this evil be met and overcome? Legislation has thus far failed to afford a remedy, and I must confess that it is extremely difficult to circumvent human selfishness and ingenuity by statute laws. There are only two ways: one is to have all fertilizing agents of home production, of domestic manufacture; the other is, to form associations among farmers, establish factories and prepare the agents for use only among those who are interested in their production. The motive of gain must be taken away or removed in some way, before the valuable plant stimulants will come into our hands in a condition so that they can be employed with confidence and success.

I think we must admit that stable dung is sold upon an improper or wrong basis. So far as I have learned by observation and inquiry, the price is fixed upon bulk and little or no reference is had to quality. Now, we know that the stable manure from one celler or vault may be, and often is, worth double that taken from another. A man who feeds his horse or other animals upon run hay, and is stinting in the use of grain, supplies to the purchaser or user a very poor article of excrement; and in livery stables the straw and litter serve to give great bulk, but little weight or substance, to the product of the yard or vault. I have ascertained by experiment that excrementitious manures, as produced at my farm, held of fertilizing substances nearly two and a half times as much in the cord as was found in those obtained from stable vaults in the city. The manure from my cellars is worth fifteen dollars the cord, when light, fine, stable manures bring six dollars.

It is of the highest consequence in successful farming that the actual quality of fertilizing agents be considered rather than appearances, bulk or color. Every substance that holds potash, phosphoric acid, lime, soda, and the nitrogenous bodies, has *value*, and the value depends upon the amount and the condition in which these agents exist in the substance. If we can know what the exact value is of the agent we are using, then we can experiment understandingly and successfully; but if we are at work in the dark, our results will be wholly unreliable and valueless.

The results of our experiments have established this point clearly, that in order to grow crops successfully, *all* the substances needed by plants must be present in the soil in which they flourish. The soils of cultivatable lands hold in a greater or less proportion all that is essential to the growth of plants. Sometimes one or more of these essentials is largely in excess, or there is more than is needed by any crop for a succession of years; and often one or more is held in small amount, barely sufficient for some crops and wholly insufficient for others. A soil resulting exclusively from the disintegration or crumbling of limestone rocks will be rich in the calcareous element, but deficient in several of the other essentials. Soils resulting largely from feldspathic masses and granite, will hold quite all that supply the elements of nutrition to plants, and such are therefore good. No two fields or farms are alike as respects the nature of the soil; and therefore, when the question occurs, how can this or that farm be restored to fertility, it is necessary to know the general composition of the soil as preliminary to any intelligent attempt to bring it into good tilth. Much of the confusion and doubt which prevail among farmers springs from this difference which exists in soils. Farmers seek for some specific manure which will insure large returns of all kinds; but no such specific exists, nor ever will. There is, certainly, no specific for our bodily diseases, and therefore, doctors in prescribing are said to feel their way in the dark. The farmer who is searching for specifics is groping in thick darkness. The intelligent doctor who is acquainted with the constitution and idiosyncrasies of his patient, possesses in the cure of disease a great advantage over one who knows nothing of such peculiarities. The most proper business of the physician is to study the peculiarities of his patients, and the most proper business of the farmer is to study the physicial and chemical peculiarities of his soils. Of course, a knowledge of the chemical and geological sciences is of great advantage to a farmer in successfully conducting his labors; but an intelligent observer can secure a good knowledge of the nature of his soils in ten years, and know but little of any of the exact sciences. Without any knowledge of anatomy, of physiology, the farmer obtains, by observation, a knowledge of the peculiarities of his animals. He learns how to feed his pigs so as to fatten them most rapidly and profitably, how to supply nutriment to his cows so as to cause a copious supply of milk, and he learns the temper and habits of his horses and oxen, and accordingly controls them to his advantage. Why should he not learn by observation the nature and capabilities of his fields, and be able to a great extent so to feed them as to obtain the highest and best crop results from year to year? Any farmer, from ten or even five years' observation, can ascertain the extent to which his different fields are retentive of moisture. He must learn how well they withstand the drought or the protracted wet of summer, how different crops behave when the rain-fall is small or copious, in the growing months. Physically considered, some farms are not adapted to the raising of corn, and perhaps some other grains. Corn withstands drought better than almost any other cereal, but that fact affords no reason why it can be raised to advantage on loose, dry soils. Weak, puny corn can be raised in a sand bank; but foolish indeed would a farmer be to plant his corn in such a locality. Corn requires a good, retentive soil, a good fine loam, in which to grow in perfection, and if the owner of lands has none such, let him not attempt to grow it. His fields are better adapted to melons, beans, rye, or perhaps wheat. It is useless to attempt to force corn or any of the noble grains to grow upon naturally wet or low clay bottom lands, without thorough drainage and deep tillage. Such are better adapted to grass, and grass farms, if kept in good tilth, are the most profitable of any. Every cultivator of the soil must first become acquainted with the physical character of each parcel he has under his charge, and then he will know what crops are adapted to the several localities.

By drainage and deep tillage, the physical condition of most lands can be completely changed, and with the supplying of such chemical agents as are needed, crops of every description can be raised, satisfactory and remunerative to the husbandman.

Colonel WILDER. Can potash be combined with coal ashes, so as to make them as efficient and useful as good wood ashes?

Dr. NICHOLS. I would say that I have made numerous experiments, having that end in view. We make a very inconvenient and pasty mass in the use of potash, because we are obliged to use it in solution before we can restore to the ashes the potash, which has been leached from them. Now, a bushel of ashes,—the ordinary ashes that are found upon our hearths, which are a mixture of soft and hard varieties of wood,—will give us a little more than four pounds of potash. I presume our soap-makers get about three and a half pounds upon the average. Now, we may buy in the market three and a half or four pounds of commercial potash, and we can mix that with coal ashes or muck, and make a mixture which will correspond in its potash strength with ashes; but it is quite inconvenient. But when you have added potash to coal ashes or to muck, you have not got what is contained in wood ashes, because you get in them soda, soluble silicate, and phosphate of lime. Wood ashes hold in association those elements of plant nutriment which correspond, of course, with the structure from which they are obtained, and consequently you restore to the land the elements taken from it by placing ashes upon the land. They have a very high value, in my estimation. I should say that commercial potash can be used, but not comfortably. I should never encourage it among my farming friends.

Colonel WILDER. Is it sufficient in restoring all these things which we call potash, and which are so necessary for plant growth?

Dr. NICHOLS. Oh, yes, sir. The ordinary caustic potash of commerce is precisely the material which is taken from ashes.

Colonel WILDER. I formerly combined it in that way, and I found it quite useful.

I have never been more gratified in my life than I have been by the lecture this forenoon, and doubt not, that is the sentiment of this assembly. It was not only a scientific, but a practical one; it was science based on practice.

Now, I have tried ground bones and leached ashes, as my friend, the president of the Horticultural Society, J. F. C. Hyde, Governor Brown, and other gentlemen are aware, for twenty years, and I have given my opinion upon that subject, but I never found anything so useful as wood ashes; and hence, I resorted to potash, making a solution and pouring it upon heaps of coal ashes, shovelling the heaps over from time to time, and mixing them thoroughly. I supposed it was useful, although I always had my doubts whether my laboratory was as good as Nature's.

Mr. WETHERELL. I would inquire the difference between good wood ashes and leached ashes, applied as fertilizers.

Dr. NICHOLS. There may be some question in relation to the relative value of leached and unleached ashes, but I think there is an undue value put upon leached ashes. We must remember that in the process of leaching, all that is soluble is removed from the ashes; very nearly all the potash and the soda are removed, and consequently the decrease in value corresponds with the value of the products that are removed. I should say, that when unleached ashes can be bought for twenty cents a bushel, it would be better to buy them, than to buy leached ashes at ten cents. Leached ashes spread upon grass ground of course will produce very good effects; but I think after contrasting these effects with the effects of unleached ashes, that farmers are often led into error. You see it is very difficult to tell precisely what actual results you get. A man buys a dozen bushels of leached ashes and places them on his field and he sees that they increase the production of his field. He buys a quantity of unleached ashes, and applies them to his field, and he gets good results; but he does not take time enough to contrast the results of the one with the other. Now, unleached ashes will carry crops several years, or three years at least, but leached ashes will generally spend themselves in one season. I should say the relative value of leached and unleached ashes was about as ten to thirty.

Mr. SLADE. I understood you to say that the value of fish pomace was twenty dollars a ton. I should like to know how you arrive at it, and what you compare it with?

Dr. NICHOLS. I determine it by actual analysis, in contrast with the cost of other products.

Mr. SLADE. Peruvian guano?

Dr. Nichols. Yes, sir, you might take that as a standard. I generally take bone dust as a standard, because that has a fixed value.

J. F. C. Hyde. You speak of pure bone dust, I suppose. What can a farmer afford to give for pure flour of bone?

Dr. Nichols. He can afford to use it if it does not cost him over forty dollars a ton. I do not think it can be used profitably at sixty dollars a ton.

Mr. Goodman. Is not that very easily adulterated?

Dr. Nichols. Oh, sir, very easily. They grind the common oyster shell and mix it with the bone dust very largely. I have obtained from a Boston company pure bone dust. but I do not say that they are going to deliver pure bone dust to everybody.

Mr. Wetherell. Would you apply that to the soil without anything else?

Dr. Nichols. Yes, sir, you can do that with advantage. It undergoes decomposition very readily. In this fine state, you would want to use judgment in applying it. I should not apply fine bone dust to a very dry field. I should rather select one that was moderately moist. Still, I have had very excellent success with fine bone upon dry fields.

Mr. Wetherell. Do you apply it to ploughed land or grass land?

Dr. Nichols. I should use it on both grass and ploughed land. Allow me to make one remark, which I think may be of some service. I have found the greatest difficulty in determining the best method of applying these fertilizers. There is a great deal in little things. For instance, I have said to my farmer friends, "You put in with your corn a handful of a mixture of bone dust and ashes;" and when I have met them again, they have said, "It burned my corn up." "How did you put it in?" "Why, I simply threw it in." "And you put your corn upon it?" "Yes, sir." Of course a highly stimulating manure like that will destroy the germ of the corn. "Now," said I, "spread it upon your soil, kick a little dirt over it, and your corn will germinate, and as soon as the little roots start, they will push right down to find that material, and your corn will do finely."

In applying this bone to fields you should not apply it in such a way as to get it into the soil deeply; you want to spread it upon the ground after you have harrowed, and then simply cover it with a brush harrow. If you cover it very deeply you will lose a portion of the effect. I say, therefore, that in the application of these fertilizers, there is a large amount of good sense and good judgment to be exercised. As far as my observation goes, I find the same difference in farming matters as in the mechanic arts. There are some mechanics who can take hold and do anything, and there are some farmers who can take hold and do anything, and there are others who do not seem to have the power to do things as they ought to be done.

Mr. Ball, of Upton. You suggested several years ago, a mixture of one hundred pounds of ashes, one hundred pounds of bone, twelve pounds of soda and twenty-five pounds of slacked lime. Do you think it is necessary to have those additions, or have you found by experiment the bone and ashes equally good without them?

Dr. Nichols. I have found the two simple ingredients, bone and ashes, to meet all the requirements of my fields. I have made a variety of compounds. Of course, it would require a great many lectures to cover the ground of all my experiments. I have used about every kind of fertilizer, in all kinds of combinations, and under all possible circumstances, as far as I could. I have kept a record of those experiments, and from them I deduce certain general conclusions, which guide me in my operations. As it regards your question, I do not remember particularly about that composition, but possibly it is one of those mixtures which I have experimented with.

Mr. Ball. It is in your address at Salem, published in the report of 1867, I should think.

Dr. Nichols. Yes, sir. I had not then made so many experiments with the simple elements, as I have within the last two years.

Mr. Ball. I was desirous to know whether that was important. I think there have been some experiments tried in our own town, in which they have used the mixture you proposed, by putting in the slacked lime and soda, and also by simply mixing the bone and ashes together. I think that some have felt that these were very important elements, and no doubt the soil to which they applied the mixture needed some elements found in the lime and soda, but others have found equally good results from simply mixing together bones, ashes and water, so that the potash could act upon the bones.

Dr. NICHOLS. I have been so much troubled to procure ashes, that I have not been able to use more than the same quantity of ashes as bone. I should prefer to use two bushels of ashes to one of bone. In the mixing of this compound you need a definite quantity of water in order to make it convenient to handle. If you put in too much it becomes pasty. I think about two buckets of water sufficient for the mixture.

Mr. DAVIS, of Northborough. I want to get your opinion upon this point: farmers can buy shorts and wheat bran for about twenty-four dollars a ton ; they can buy Indian meal for thirty-six or thirty-eight dollars a ton. Now, what I want to know is, whether it is not better to throw aside all these chemical manures, and buy shorts and meal, and feed them to the stock on your farm, and enrich your manures in that way, then you know what you have. I want to cut the knot directly.

Dr. NICHOLS. Well, sir, I presume all good farmers who feed a good quantity of grain to their cattle and good hay, are very well aware that the grain adds value to their manure.

Mr. BOISE, of Blandford. I have at my command a large number of the skulls of slaughtered animals that have been accumulating for a number of years, and the question has been how to dispose of them. We can use wood ashes, for wood is burned wholly in our locality. I think you have suggested that bones might be burned. I would like to ask the relative value of burnt bones compared with bones packed with ashes, and decomposed in that manner?

Dr. NICHOLS. Well, sir, by burning you remove the gelatine of the bone, and lose all that nitrogenous portion, which is a very valuable portion to retain. If you could take the bones to a plaster mill and have them ground down, I should advise you to do so.

Mr. BOISE. There is no plaster mill within ten miles of me, and I find it takes a long time to work them down with ashes.

Dr. NICHOLS. In order to dissolve bones in ashes, a little experience and manipulating skill are required. You want to put them into a shallow box, and give them ashes enough to operate upon them. You can do it in that way with great facility, but I can see how any one can make a failure in an attempt of that kind.

Mr. Boise. I would also like to ask what is the commercial analysis of a fertilizer sent out to the members of the Board the past season, under the name of the "Bay State Fertilizer." What is the value of that?

Dr. Nichols. I am not acquainted with that. There are very many of these different substances. I received last evening, just as I was leaving home, a circular from a party who is manufacturing "Caploophite," for fertilizing purposes. I do not know what he means by it, but I was quite amused while passing up in the cars and reading it over, to see the ignorance and impudence of the man who offers it for sale, or rather, who offers to sell rights to make it. He has got quite a quantity of testimonials; you know testimonials accompany all these things; but there is not a single chemical combination involved in this, that has any sort of basis to rest upon. I should judge from appearances, that the right to make this article might be very extensively sold.

Mr. Wetherell. You spoke of farmers combining to manufacture their own fertilizers. Could not that be done by farmers forming associations, and thus cheering each other on?

Dr. Nichols. Oh, yes, sir. I think that is a very hopeful view to take of it. I think that farmers could combine and purchase a mill, grind their own bones, and make their own fertilizers. Quite a number of such companies exist in England, and they have been very successful indeed.

Colonel Wilder. An article called "Muriate of lime" has been sold in considerable quantities in Massachusetts, and some very good testimonials are presented in relation to it. Have you any knowledge of that?

Dr. Nichols. It is an entirely inert substance. It is not worthy of a moment's consideration. It is not a manure.

Mr. Slade. The conclusion I draw from the manner in which you renovated your farm was, that it was much more economical than to have bought stock, hay and grain, and renovated it in that way. The question that I would like to ask is this: whether, if you were now farming it, and intended to farm it for years to come, exclusively for profit, it would not be best for you to dispose of all your cattle and all of your farm products, and continue to keep up your farm by fertilizers ?

Dr. NICHOLS. If I should sell off all my stock and continue my experiments with special fertilizers, at the cost at which I should obtain them, I think I could maintain my farm in as good tilth, and in as favorable condition, and I think rather more so, than by keeping stock. That is the result of the observations of seven years.

Mr. SLADE. Can you not do this better than general farmers ? Would it be best for us to undertake to renovate our farms in that way, unless we have better facilities for getting purer articles than we have ?

Dr. NICHOLS. I should speak with a great deal of caution in relation to that ; I find it so difficult to convey the idea. Of course, it must necessarily be easier for me to manipulate in this way than for others, because my whole life has been spent in it. But at the same time, I see no difficulty in any person manufacturing these fertilizers upon their own farms. For instance, it is a disagreeable thing to handle oil of vitriol. It is an article with which you may spoil a suit of clothes in a day, which would be unpleasant. In the first place, there should be great care used in turning out the oil of vitriol from the carboy to make superphosphate. I suppose I could turn out a ton of oil of vitriol, and scarcely get a drop on my clothes. It is my facility of manipulation. Some people have undertaken to measure it in wooden vessels ; but an ordinary stone pitcher would be perfectly safe. By paying attention to these little things, anybody can make superphosphate, and make it with just as much facility as I can. But if one is easily discouraged and allows little matters to disturb him, he would be very likely to give it up. I have always taken the ground, and insist upon it to-day, that you can make all these things upon your own farms just as well as I can, if you will persevere.

Mr. WETHERELL. Would your farm continue for generations to improve by the use of these special fertilizers, as it would with the use of animal excrement ?

Dr. NICHOLS. I might base my reply upon the assumption that plants need food, and I conceive it to be of no manner of consequence through what channel they get that food. Provided we furnish that food for them in an assimilable condition, it makes no difference whether they get it from bone, from nitrogenous products, or from manure. It resolves itself into the question of cost—which is the cheapest? You can attain these results in both ways. Which is the cheapest? I regard bones, at a cost not exceeding forty dollars a ton, as a cheap fertilizing agent; but if you have to pay sixty dollars a ton, I should probably not advise their use very largely. Of course there are special purposes for which you must use bones. For instance, on low ground, where you cannot go with your oxen or horses. I think that is a very important point to consider—that you can carry these fertilizers where you cannot carry manures. But at sixty dollars a ton, I think it would cost more to produce a crop from bones than to produce it from other sources. You are not using a strange thing when you use bones. You are using what the plant requires. If it gets it from bones that is one source; if it gets it from manure, that is another source. Bones will furnish plant nutriment if you put them in an assimilable condition. If you do not, they are no better than pebble stones. If you make them fine enough, you will receive benefit.

Mr. Stone. I recollect thirteen years ago, reading in Stöckhardt's Field Lectures, that in Saxony, and in some of the adjacent provinces, they had abandoned the use of manure, and were using only bone dust. Do you know the result of those experiments, or whether they still continue?

Dr. Nichols. I do not; but I have no hesitation in saying that in Saxony, and through that section, they use bones very largely indeed, with very great success. There has been some wrong teaching in regard to bones on the part of chemists, but as soon as we understand them, and know how to apply them, I regard them as very important fertilizing substances.

Question. Is there not a great difference in wood ashes, growing out of the wood they are produced from, and will not some work up bone quicker than others?

Dr. Nichols. Undoubtedly. I have usually recommended adding to the heap a few pounds of caustic potash. You will find that it will aid you very much in breaking up your bones; and you can use caustic soda with great advantage. It is cheaper than potash.

Mr. Hapgood. I have a quantity of coal ashes, and I thought they might be worth something as fertilizers, though I do not know how to use them. I would like to know if I can make any use of them as fertilizers.

Dr. NICHOLS. I should advise you to use them as a top dressing for low lands. Put them on your meadows as they are. They are a little better than sand—not much. Usually, there is about five per cent. of soluble matter in them.

Mr. ALEXANDER HYDE. In the western part of the State, we use leached ashes abundantly, and we find somewhat different results from what you have stated here to-day. I would like to know if your leached ashes were not commercial ashes, which were diluted with sand? I fear you did not do leached ashes quite justice.

Dr. NICHOLS. I do not know how to present the relative value of leached ashes except by simply stating, that you cannot get something out of nothing. That is impossible. We regard the potash and soda in ashes as being the two great essentials. You know potash enters into all our cereals very largely, and is one of our most important mineral agents. If you put your ashes into the hands of the soap-maker, he extracts all the potash and soda, and you have them back minus all that is soluble; and in order that he may extract the very last particle of potash and soda, he will add a little lime, which has the effect to extract from the ashes all the caustic potash and soda. I never made a comparative experiment with leached ashes, because I never felt that I could make one without acting somewhat empirically. It would be an empirical undertaking to contrast the fertilizing effect of leached and unleached ashes, because I know before I begin precisely what I have, and I cannot expect to get something out of nothing. I might get something that would delude me by appearances, but in reality I could not be deluded, because I know what the composition of leached and unleached ashes is; at least, if the leached ashes are thoroughly exhausted. I must confess that in some instances they are not fully exhausted, and in that case, they are worth a little more than if fully exhausted.

Colonel WILDER. I suppose in relation to the use of barnyard manures, where they can be had conveniently, you would approve of their being used in a mechanical sense. That is, they would have a good mechanical effect upon the constitution of the soil ?

Dr. Nichols. Oh, yes, sir, I do not believe any chemist has ever said a word against barnyard manure. That would be perfectly absurd. The great question with us, as agriculturists, is, can we bring our lands into good condition, can we raise crops from manures outside of barnyard manures ? That is the question I have endeavored to solve, and I have satisfied myself that it can be done. A great many have an idea that these artificial fertilizers are very transient in their effects ; that you get a little influence the first year and none the next. I have tried the experiment for seven years, and I have given you the results. I am manufacturing now considerable quantities of these different fertilizers for experimental purposes ; but I have animals enough to give me a very large supply of manure, and it does away with the necessity of making these manures. I sell milk, and of course I have a great amount of manure.

Asa Clement of Dracut. I listened attentively to the interesting and instructive lecture of Dr. Nichols; and I must say frankly, that on one point his remarks have surprised me ; that is, in relation to the value of leached ashes. Chemically speaking, the doctor is probably correct when he states that the potash which is at the time soluble is extracted in the act of leaching ; but it is apparent that something remains, which, subsequently, through atmospheric influences, mechanical or chemical agencies, or possibly all combined, acts beneficially upon some soils at least, and in my humble judgment, based upon experience and observation on other than sandy soil, that the effect seems to be more noticeable on the lighter soils.

A neighbor of mine having a large piece of what is usually denominated pine plains, applied one hundred and twenty-five bushels to the acre, on some twenty acres, for seven years in succession—planted the same each year with pop corn, which improved in quality and quantity from year to year. The soil also apparently improved, becoming more retentive of moisture ; when, in 1869 a portion was sown with grain and clover seed. In 1870 two crops of clover were harvested, the first, as large as I ever saw standing upon any soil ; the second crop was affected somewhat with the drought, which was very severe and pinching in that locality. That land, however, bore the drought better than any other in the vicinity, and the second crop was large, comparatively.

There is no commercial fertilizer to my knowledge which is more universally esteemed than ashes, both leached and unleached, and that by practical men who have used them long enough to learn what they are about. I would like well to secure five hundred or a thousand bushels yearly, and there are scores of others who would gladly do the same, but the quantity is limited, if the would-be purchasers are not. I refer to spent ashes. To use with peat as a corrective, a *sweetener*, undoubtedly unleached ashes at thirty cents a bushel, if of good quality, will prove a profitable investment.

[At this point, Colonel STONE vacated the chair, introducing the Hon. CHARLES G. DAVIS, of Plymouth, as the regularly appointed chairman for the day.]

The SECRETARY. We have present here to-day a member of the New Hampshire State Board of Agriculture, who is very much interested in the question of manures, and I would suggest that he be requested to make some remarks upon the subject before the Board. I allude to Mr. Lawrence.

Mr. LAWRENCE. I am simply a practical farmer from New Hampshire, and I feel embarrassed in coming before you and attempting to make a speech; but, sir, my experience has corresponded so very nearly with that of the gentleman who has given us such an interesting lecture this morning, that I felt desirous of saying something in regard to this question. Before, however, I proceed with that, I will say that I am the only member of the Board of Agriculture of New Hampshire who is present, and that I am here in their behalf and in their interest, to ask that more shall be returned to us than we have given to-day, and to say that we hope, at the future meetings of our Board, we shall have the presence of some of the members of your Board and of representatives of the farmers of Massachusetts. We have held the present month, for the first time, a meeting of the Board of Agriculture of New Hampshire. It has been a very interesting session of two days, but I did not see the young men present there that I see here; neither did I see that desire to occupy all the time that I have seen here.

I live upon a farm of three hundred acres. It has descended to me from my father, my grandfather and my great-grandfather, and I have always been a laborer upon the soil with my own hands. I have managed that farm for the last eleven years exclusively. At the time of my marriage, my father removed and left it under my control; but having labored with him all my life, I had decided convictions in regard to the manner in which he was managing the farm, and in regard to the manner in which it had been managed. It had been his custom, and that of those who preceded him, to consume all the hay and other products of the farm upon it. He had kept forty head of cattle; but notwithstanding that, it was in a very poor state. I determined to adopt a different style of farming, and my first step was to reduce my stock nearly two-thirds, and undertake to carry out a system of farming which I thought might prove profitable; and, gentlemen, it has. The farmers in my vicinity all said that if I adopted this style of farming, I should not keep the farm up where my fathers had kept it; but last year I submitted my farm in competition with others in different parts of the county for a premium of fifty dollars, and I am proud to say that I received that premium. (Applause.) Sir, that result has been reached without the expenditure of ten dollars for barnyard manure. In competing for this premium, I had to compete with some of the best farms and some of the best farmers who live within twenty miles of me. Any of you who know anything about that portion of Stratford County around Dover, and Rollinsford, and Durham, and Somersworth, know what I had to compete with. In that section, there is some of the best land in the State of New Hampshire, and some of the farms were within two or three miles of Great Falls, Salmon Falls or Dover, where manure could be purchased at a fair price, and where the cost of cartage was but little. I live six miles, at least, from where I can purchase a single load of barnyard manure.

I commenced with the idea that, on a farm like mine, I must use the hoe less and the plough more, because I believe that experiments have proved that in turning over an acre of land that is partially run out, we turn under twelve tons of organic matter, in the shape of roots, which will rot, and very largely enrich the soil. To do this as easily as possible, I turn over my land in the fall, apply my manure, harrow it in slightly, leave it to the action of the frosts during winter, and in the spring put superphosphate in the hill. I have never failed to get good corn. This system has been adopted very generally in our section, and we find that manure applied in the fall is very much more valuable than that applied in the spring, because having been worked into the soil and lying there through the winter, we believe it gets into a proper condition for the plant in the spring. Besides, it saves labor in spring, when time is valuable and labor high, and the cost of the superphosphate or bone dust will not be much more than the cost of applying the manure in the spring. I have relied somewhat upon potatoes, and those I plant entirely in my pastures, that had not been planted for sixty years. I have not got a very large return in money, thus far, but when I sell them I hope the price will be higher. But I have relied principally upon hay, and I believe that is the only system we can pursue and make money.

If you ask me what I have relied upon for manure, I will say that I have expended six or seven hundred dollars for superphosphates. I have listened with a great deal of attention to the doctor, and shall endeavor to profit by what he has said. If it is a fact that I can produce something that is more lasting in its effects and better for one-half the price, by manufacturing it upon my own farm, certainly I want to do it, and I shall have learned a very important lesson to-day. The superphosphate which I have used, I believe, is made in Boston, by Mr. Bradley. It is a very good article, but if there is a better and cheaper substitute for it, I surely want to know it.

My custom has been to commence turning over my land just as soon as my hay was secured, and although I am busy in spring, I have always been a great deal busier in August and September. I begin upon my lowland, and when I have turned it over, I apply superphosphate or ashes, or whatever I can get. I formerly used ashes; I did not believe I could get anything better; but they have cost so very high, that I have abandoned their use. I have found I could not manure an acre of land short of forty dollars, where half of that money expended for superphosphate has done very well. On my farm there are three lots which were laid down four years ago, one with ashes, another with manure, and the third with superphosphate, and I really cannot see any difference in regard to the products of those different lots thus far.

As I have said, I begin to plough immediately after haying, taking my wettest and lowest land first, and applying whatever manure I have got; then I take lands a little higher, turn them over, and apply the manure. I wait until the second crop has started on my high lands, and then plough that under. That I believe to be a very great advantage indeed, and the committee who visited my farm said that they had never seen in any one field of sixty acres so much second crop as there was in the field which I presented in competition with the farms in my county.

By pursuing this system, I have succeeded not only in making my farming better, but I believe I have made it profitable, for I have to rely upon that entirely. But there has been one question raised here which it seems to me is a very important one. I have pursued this system for eleven years, but that is only a short time. The question is, can the same course be continued for generations? I believe that my fathers, in carrying on the farm as they did, supplied that land constantly with one kind of manure—that made from cattle. It may be that in supplying that, they have not furnished to the land something which I have furnished in the manures which I have applied, and in consequence of that, the application of these special manures has been successful. I am confident that very many farms can be made profitable by the adoption of this system. I mean to continue this system as long as I find it profitable; but if, after I have turned these lands over three or four times and continued this same system, I find that it is not for my interest, of course I shall abandon it.

There is a great deal I should like to say, but I have seen the eagerness with which you farmers have asked questions, and I will not longer trespass upon your time. It is possible I may engage in the debate this afternoon, but at any rate, I return to you, gentlemen, my thanks for the kindness with which you have listened to me.

Mr. Ball. I would like to press the question a little further which was considered a few moments ago. I think there is no question but what Dr. Nichols has stated the fact in regard to these fertilizers, but if the doctor has any data from which he can give any approximate answer to the question (for I think the answer can only be approximate), I hope he will do so. The question is this, whether if twenty-four dollars are spent for shorts, and the shorts added to one ton of hay, the excrement resulting from that, if applied to the land, will give anything near the value which the same amount expended for special fertilizers would give? It seems to me that if we can have an answer to this question, it will be valuable to us, from the very fact that we have such difficulty in regard to buying these things that are offered as fertilizers. The same question might be asked in regard to corn: whether thirty-six dollars expended for corn, and the corn added to a ton of hay, and passed through an animal, the corn will add as much to the value of the manure as thirty-six dollars expended for any of the superphosphates which are thrown upon the market, or expended in any way in which the money could be expended for these various fertilizers?

Dr. NICHOLS. I don't know that I could answer that question, because shorts differ in their value very much. And then, you know, the manure coming from different animals is very different. But thirty dollars' worth of shorts would give half a ton of fine bone, as it is sold in the market. I should prefer that half ton of bone. I could make more out of it.

QUESTION. I should like to ask Dr. Nichols if he has any knowledge of the relative merits of ground bone and fine horn. There are sections in Massachusetts where horns are manufactured into combs quite extensively, and large quantities of fine horn can be obtained there.

Dr. NICHOLS. That is a practical question. I have used horn shavings in various ways, and they are very valuable. I usually rot them. They are very nitrogenous. They will make a magnificient stock of wheat or corn, but they will not give you plump seed without bone.

The CHAIRMAN. I think there is a lurking feeling among almost all unscientific people, that, after all, there is some element of uncertainty with regard to the result of chemical inquiries. For instance, the statement is very often made, in regard to the analysis of soils, to see whether they are fitted for the growth of plants, that there is some element or some process which is as yet undiscovered by chemists; that, given a certain soil, they do not know by its chemical ingredients what crop it is best fitted to produce; that the air may furnish some elements while the plant is growing. This was strikingly illustrated by the inquiry in regard to leached and unleached ashes. There is a very general opinion, and I certainly have entertained it, that leached ashes produced a good effect for a long series of years. For fifteen, twenty, twenty-five years, their effects can be seen on grass land. The doctor puts them at one-third the value, chemically, of unleached ashes. I think there will be difficulty in persuading the farmers of the Commonwealth that, practically, there is this difference, although chemically he finds it so. The question I wish to ask is,—and I ask it in order that his statement may go out to the Commonwealth fortified with all the assurance he can give, if he is of that opinion,—the question I wish to ask him is, whether chemists feel satisfied, beyond all question, that chemical results can be followed with the faith with which he has asserted them here to-day? I think that such an assurance as that would add greatly, in the minds of the public, to the good effect of the lecture, in satisfying them that there is something by which we can supply the defects in some soils.

Dr. Nichols. I would say, in reply to this inquiry, that I have great faith in the absorbent power of the soil. Of course, the audience understand that we cannot obtain from the atmosphere anything which we get from the potash. I have always been extremely cautious not to overestimate the value of chemistry to agriculture. I have endeavored to be so to-day. I think chemistry is capable of aiding us very materially; but when the question comes up whether the relative value of leached and unleached ashes is what I have stated, I should say, chemically, I am not certain. I suppose some soap-boilers do not remove the same quantity of potash that others do. I can see no necessary connection between the application of unleached ashes to the soil and the atmosphere whatever. I am quite aware that leached ashes contain soluble silicates to a certain extent; they are not exhausted of their entire fertilizing principles; but they are exhausted of those elements which we find to be essential to plant growth. If leached ashes are just as good as unleached ashes, I should advise you to buy all the unleached ashes you can, leach them, and sell the potash, for you can get about nine cents a pound for it, and then use the ashes afterwards. Don't you see that would be absurd? I can't tell you the exact value of unleached ashes. I have never tried an experiment of that kind, and I never should, because I cannot see any necessary connection between the results I might obtain and anything practical to be deduced from them. I should advise, in a general way, the purchase of leached ashes at about ten cents a bushel. I cannot get at it in any other way. They either have or have not value, and if they have value, it is a fixed value; when we get out of that, we are in the dark. Here are these certain elements, which are essential to the growth of the plant; they all have a commercial value, and if they are in an assimilable condition, they are worth more than in an unassimilable condition. I take those two things into consideration, and that is the only way I can form any opinion. I cannot guess how much benefit I can get from a bushel of leached ashes. I infer, if all the potash is removed from them, as the soap-boilers are very apt to remove it, the value is one-third that of unleached ashes. I do not know but I am overestimating it in that way; I don't know as it is as high as that. I do not know how I can present this point in any clearer way; I wish I could. It is very difficult to state definitely what will result from a combination of fertilizers, and it is utterly impossible for me to state what will be the result if I do not know what the fertilizers are made of.

I am afraid we do not carry these experiments far enough to be able to arrive at fixed results. I have endeavored to do so. I think we cannot reach solid ground until we carry things far enough and observe closely enough. In the first place, we must know what we have got in our hands to work with. I might make an analysis of leached ashes, and in the course of years, using them constantly, I should be able to form a pretty good judgment of the results, but I cannot state them off hand.

The CHAIRMAN. I would not have the doctor understand me as intimating that one is as valuable as the other; but the effect of leached ashes was shown so long, that they were believed to be a valuable manure.

Dr. NICHOLS. I think as much harm as good is sometimes done in meeting a prejudice for or against a thing. I hesitate to speak of some matters because I am afraid a wrong impression may be conveyed. I do not wish gentlemen to get the impression from me that leached ashes are worthless, because it is not so. They are worth something, and they do a very good work on grass land. They are worth at least ten cents a bushel, for that purpose. It is the money value that we want to ascertain. That is really the whole question.

Mr. Brown, of Concord. I have been greatly interested in the lecture to which we have listened, and very highly instructed, as far as I could comprehend it. I have tried to keep within reach of it, as far as I could; but I question whether many of us were able to follow the lecturer through and understand all the terms which he used—and he used very few technical terms compared with those which are used in his business generally.

Some points in the lecture are exceedingly encouraging. The first point was in regard to the culture of Indian corn. I will venture to say that the good old State of Massachusetts pays between two and three millions of dollars annually for Indian corn; and where does that money go to? The towns throughout the State of Massachusetts are furnished with corn from the West, in the form of corn and corn meal. So it is in other New England States. I have known of two or three thousand bushels carried in one year into a town in New Hampshire, with a population of only thirteen hundred souls; and yet the cry is among the people all over the State nearly, that it is unprofitable to cultivate Indian corn. Now Dr. Nichols has put it down at a cost of forty-five cents a bushel, and I have no doubt that he is precise in his statement, from my own observation of his operations. But in my own town, on the farm adjoining mine, I have seen a crop of eight hundred bushels grown, and the man who raised it stated to me that the whole cost was not one mill over twenty-five cents a bushel. For twenty-five years past, I don't believe there has been a year when I could not raise corn cheaper than I could buy it from the West or South. And yet the feeling is general all over New England that we ought not to cultivate Indian corn. I think the doctor could reduce the cost some five or ten cents a bushel, but I am not certain. I should like to know whether he credited the corn crop with the cost of the preparation of the land for the grass crop, because that is a very important matter.

The great object in raising corn is to prepare the land for the grass crop, which he says is the most profitable crop we raise here. I think if that item were deducted, it would bring the cost down to thirty-five cents a bushel. Can we not do that all over the State of Massachusetts? I believe we can.

But I wish to touch upon one or two other points. One is, the frauds in fertilizers. There is no doubt that we can use them to very great advantage, if we get what we pay our money for; but we do not always get it. I think the frauds are very constant and very great in most of the fertilizers we purchase. Some instances have come to my knowledge, as they have, I have no doubt, to the knowledge of every gentleman present. A friend of mine went to the owner of one of the large sugar refineries in Boston, and asked him if he had any use for the sugar waste of his refinery; I suppose he had seen some of it. The gentleman said, "It is not good for anything. I have sent it round to some of my friends in various directions, and asked them to let me know something about it, and they all say it is good for nothing." My friend said, "You have not sent me any." "Well," said he, "I will send you some if you wish, but I can't sell you any, for a certain man has engaged all I can make." "Who?" "Mr. Bradley." "The man who makes superphosphate?" "Yes; we have a standing order to furnish him with all the waste we have." You will naturally inquire, "What does Mr. Bradley do with that sugar waste?" I am sure I don't know. You must draw your own inference. This gentleman supposed it was good for nothing, and all the persons to whom he had sent it had reported it worthless, so far as they had observed. I cannot conceive that there is any other than one use to which that waste from the sugar refinery is put. What do you pay for that superphosphate? Sixty dollars and more a ton.

Another friend of mine went into Boston, I think to Long Wharf, to buy some fish pomace. The man said he had none to sell. "Don't you manufacture it?" "Yes, in large quantities; but I have none to sell." "Why not? my neighbor has purchased some of you, and I would like a few tons. Why won't you sell it to me?" "I have a standing order for all I manufacture." "Who takes it in such quantities?" "Mr. Bradley, who makes the superphosphate of lime." I want to know if we can afford to pay sixty dollars a ton for fish pomace, which the doctor tells us is worth twenty dollars, and how we can afford to pay sixty dollars a ton for the waste of a sugar refinery, which those who make it and those who have experimented upon it declare to be absolutely without value. I say it is a shame that the farmers of this Commonwealth and of New England should be cheated in this way. The farmers ought to combine as one man and put it down ; and there is not a day to be wasted before we begin upon it,—not a single day.

I will detain you but a moment longer. I said at the outset that I was unable to comprehend all that a chemist says when he speaks of these matters. The doctor has used fewer hard names than I am accustomed to hear when chemists speak on agricultural topics, and having conversed with him frequently on this subject, I am probably able to comprehend more than I should be able to if I had not had this privilege ; but I declare to you that I am greatly encouraged by what he has said and what he has done. I have been over his farm repeatedly, and I have been amazed to see the crops standing there and the condition of the land. Even the stubble-land will show you that the crops have been very large indeed. I went on to one field, on which no excrementitious manure had been put for seven years ; a man had just gone over it with a mowing machine, and I calculated there was a ton and a half per acre of the very best English hay lying upon the ground that day—redtop and timothy—worth some dollars more a ton than the coarse timothy that gives you two and a half or three tons to the acre. These things are encouraging, and if it were not that I doubt if the doctor would be able to talk with all the people who would naturally visit him, I should advise you all to go and see what he has done with those little fertilizers that he carries in his waistcoat pocket or in his hat, and drops them at his pleasure on swamp or plain, and produces such wonderful crops. I believe there is something to learn in regard to these things. I am always engaged in looking ahead to see if we cannot adopt some method of conducting our operations by which we can realize profits equal to those of men skilled in mechanical pursuits. But what I wish particularly to urge is, that some combination be formed among us to put down these cheats and frauds at every turn when we undertake to buy fertilizing matter. We have endured them long enough.

In respect to ashes, I think the effect of leached ashes is more lasting than was suggested by the lecturer. So it is with muck. I can take you to a field in my town on which an ox-cart load of muck was put thirty years ago, and you can see the effects of that muck to-day. I can show you another field of sixteen acres, one-half of which received a coating of muck thirty years ago; the field has been cultivated and manured just alike all the time since, and the line between the two parts of the field is just as distinct as the aisle between these seats.

If any word of mine should induce you to use these broad deposits of muck which a kind Providence has kept in reserve for us through so many centuries, I should think my time well expended and yours not lost. Many people of my acquaintance have, during the dry time the past autumn, gone into the swamps, and I think that thousands and tens of thousands more loads of muck have been carted out this fall than ever before in a single season. Notwithstanding some prominent speakers describe muck as good for nothing except as an absorbent, I think you cannot do a better thing on your farms than to use the largest quantities of good muck that you can lay your hands on. I do not see but that it operates just as well upon granite lands or upon clay subsoil as upon sandy soil. Peat has a most happy effect upon all sorts of plants. If I have a rose-bush that I want to push ahead of all its neighbors, I go and dig up the earth around it, and put in a quantity of dried peat. I have not hesitated to declare, at the numerous conventions I have attended, that every cord of muck placed upon the soil was worth two dollars, and it does not cost that to get it. I do not think a farmer can do better, or can enhance his profits more than by the use of good meadow muck.

Mr. Barnard, of Worcester. I am glad the gentleman has broached the subject of meadow muck. Forty-five years ago I went on my farm, which was very much run out, and only able to keep four cows and a yoke of oxen. I commenced digging out muck and putting it into my barnyard and hog-pen, and used it very freely. I had one barn 50 by 36, and another 40 by 30, and about twenty tons of hay to put in. At the end of three years, I filled the two barns to the ridge-pole and one barn floor. My father wanted to know where I got so much manure. I told him I went into the swamps for a large portion of it. I have continued to use muck up to the present time. I have been told by my neighbors that if I used it so freely I should run my farm into meadow grass. I told them I would take the risk, but I did not believe that those rotten leaves and roots which had lain so many years in the muck bed, were going to vegetate, and I don't believe they will.

This fall I went into the meadow with my men and got out some twelve hundred loads of meadow mud. I design to use it on my farm. I would give more for a load of that meadow mud on my farm than I would for the same amount of fire-fanged horse manure. I use it as an absorbent under my barn. I think three loads of that put under my barn, mixed with one load that goes through the stable and with the urine and slops, will come out worth more than four loads of manure would be worth, if thrown out the windows in the way that farmers usually do around the country. It would be worth four times as much as the manure from the same cattle, treated in the ordinary way. One of my neighbors showed me a field where he used half meadow mud and half manure, and another field where he used only manure, and asked me which I thought was the best-looking corn. I told him, and he said that field was manured with half meadow mud, and the other with clear manure. The corn was decidedly the best where the mud had been put. Using so much mud as that, I have not, in the forty-five years, paid out a hundred dollars for manure to put on my land. I am now enabled, on the same farm where I used to cut twenty-five tons of hay, to keep four oxen, four horses, and a bull in the barn the year round, and winter (including the oxen and bull) forty head and over. I use about eighteen acres of pasture, and on that I had twenty cows this summer that gave me three hundred quarts of milk a day; eight of them gave me one hundred and seventy-eight quarts in a day. I have brought my farm up with stable manure and meadow muck. An acre of it is worth more than any five acres were when I began on it. I have dug out the muck where it is fifteen feet deep.

Mr. Lawrence. I believe the value of muck is in applying it to soil of a directly opposite character to the muck itself. I do not believe it would be of any use to apply muck to cold and wet muck land.

Then in reply to what has been said in regard to phosphates: I don't think I went into this expenditure of seven or eight hundred dollars for phosphates with my eyes quite so nearly closed as the gentleman seems to infer. After I had experimented with phosphates for awhile, I found a particular kind that I thought good. I chose to take that because it seemed to me it was the best. But there was another reason why I chose it. I recollected years ago meeting a man who was collecting bones, which he took to a phosphate manufacturer, and for which he received thirty dollars a ton. How large a proportion of those bones entered into the composition of the phosphates, I am unable to say; but if it was a fact that those bones, costing that amount, went into the composition of the phosphate, I think there was more expense attending its manufacture, and more value in it, than Governor Brown would seem to believe. I think, moreover, that Peruvian guano furnishes the ammonia for those phosphates, and I know the price of that is eighty or ninety dollars a ton. How largely that enters into the composition of the phosphate, I don't know, but I think, notwithstanding bone-black is not worth anything, that I have reason to know that the phosphate I have used is a valuable manure.

Mr. BARNARD. My farm is very springy, and below my house, down towards the peat mud, it is very moist. I have put in miles of underdraining, and I wish I had put in miles more of it; but the peat mud has been used exclusively on hard-pan land; I have no sand land.

Mr. FORBES, of ———. Many are aware that Solon Robinson, of the "New York Tribune," recommends the use of lime and salt as a special manure. I would like to inquire whether any of those present have used it, and are able to tell the results.

President CLARK. Two or three questions have arisen recently in the discussion, which perhaps make it proper for me to say a word.

In the first place, I was very much surprised at the statement made here that the refuse of a sugar refinery is of no value. Gentlemen perhaps know that sugar is refined by solution and filtration through bone-black, and that bone-black is made by calcining bones. The gelatinous matter in the bones is thus converted into charcoal, and the phosphate of lime remains in a very porous condition. This substance is a wonderful absorbent of the coloring matter which the refiners desire to remove from the sugar. The refuse of refineries, therefore, must be a valuable fertilizer. It is pure burnt bone, with a certain amount of carbonaceous and nitrogenous matter obtained from the crude sugar. I should hope that Mr. Bradley would put a large amount of it into his phosphate, especially if its solubility was increased by a suitable amount of sulphuric acid.

Then in regard to his use of fish pomace. As I understand it, this fertilizer is advertised as an *ammoniated phosphate*. It is not designed simply to supply certain desirable manurial matter, but also to quicken vegetable growth. It is a partially ammoniacal or nitrogenous substance, and so is a substitute to a certain extent for barnyard manure. Now the fish pomace undoubtedly is a vegetable ingredient in a phosphate of this description, and by its fermentation and supply of ammonia may prove to be actually worth all its cost in the form in which it is applied in Bradley's phosphate. It has been said here that Peruvian guano is put into Bradley's phosphate, to a certain extent, and into some other commercial fertilizers. It is not probable the manufacturers use very much of the best Peruvian guano, but this leads me to a subject which may be of importance to the farmers here who buy this article. In the valley of the Connecticut a great quantity is used, especially in the cultivation of tobacco. Nearly two hundred tons were bought by one man and brought to the depot in Amherst this year. Therefore it becomes a momentous question, what this substance is which we get as Peruvian guano, and for which we pay such an enormous price. Having the facilities for testing such things at the Agricultural College, we took some specimens from different purchasers and subjected them to analysis, and these analyses we shall probably publish. We find a surprising diversity in the composition of different samples, and some are certainly not worth one-half what they cost. The Chairman (Mr. Davis of Plymouth) has asked whether chemists generally have faith in chemical science; whether farmers may believe that the deductions of Dr. Nichols are reliable. In reply, I would say, we do believe, absolutely, that chemical science is more exact and trustworthy than almost any other; and we have no fear that any practical trial will invalidate the statements of an intelligent chemist. This idea of restoring the fertility of exhausted lands by the direct application of chemical substances, which has been so ably presented in the lecture this morning, is of immense importance. The experiments of Dr. Nichols demonstrate the fact that potash and phosphate of lime are the two most indispensable fertilizers. These, therefore, we must constantly strive to procure as cheaply as possible. Wood ashes and bones supply them in the most desirable form, but they cannot be obtained in sufficient quantity. We must therefore seek these precious substances in the rocks, where they exist in exhaustless abundance.

From saline deposits like those at Stassfurth in Prussia, we may now procure potassa; and doubtless at no distant day we shall be able to disintegrate by chemical or mechanical means feldspathic and other minerals, and extract economically their contents of this valuable alkali.

In regard to phosphate of lime, it is certain that enough may be procured from the recently discovered deposits in South Carolina to enrich all our worn-out lands, and preserve their fertility for thousands of years. Before, however, we can derive the greatest possible advantage from this mineral phosphate we must discover some method of rendering it soluble without the use of sulphuric acid. This is now employed for converting the mineral into superphosphate, but the process is very expensive in consequence of the large amount of carbonate of lime associated with the phosphate.

Efforts are now making in the laboratory of the Massachusetts Agricultural College to accomplish this desirable result, and, as we believe, with a reasonable prospect of success.

The value of scientific knowledge to the farmer was never more clearly demonstrated than in the discussion we have just had respecting the preparation and use of special fertilizers. When we have more educated agriculturists we shall save much which now goes to waste, and many frauds, now common, will be no longer possible.

The greatest saving, perhaps, when knowledge abounds, will be in words, for ignorance is the principal cause of the interminable discussions so proverbial among those who attempt to write or talk upon agricultural topics.

The muck question is a good illustration. One gentleman here declares he has grown rich simply by the liberal application of muck to his farm, and thinks he could not afford to cart stable manure from the city near which he resides. Another asserts that he has tried muck on his land and found it perfectly worthless ; while a third says with much feeling that he has nearly ruined his farm by its use, and wished what he has dug was all back in the swamp.

Now these different and contradictory views of the value of muck are at once harmonized by the light of science. If we consider the origin of the substance we cannot wonder that its effects are so variable. In one case it may have originated from the decay of a mass of forest leaves only, and must of course be very rich. In another case it may have been formed from the decomposition of mosses and sedges, and contain much less valuable elements, or it may consist largely of sand, and so be comparatively worthless, or it may be impregnated with protoxide of iron, which is a deadly poison to vegetation.

In this connection, it occurs to me that Dr. Nichols publishes a monthly paper called the "Journal of Chemistry," which is remarkable among our periodicals for the correctness of its statements in regard to all matters of the application of science to the common arts.

The subject of aqueduct pipes has recently been discussed in the "Journal" in a most admirable manner. It has long been known that lead pipes were unsafe, and within a few years galvanized iron has been largely introduced in its stead. This, however, is shown by Dr. Nichols to be even more injurious than lead, and ought never to be used. If any one wishes to poison himself or his stock, let him employ at once a dose of white vitriol, and he will attain the same result with some saving of time.

The best pipe for water to flow through under pressure is wrought or cast iron pipe lined with common hydraulic cement. If the pressure be small and the water abundant, cement pipe without any iron may be adopted.

In the case of pumps connected with wells, the best pipe to stand in the water is block tin, and, in the ground, lead pipe lined with tin. Block tin corrodes rapidly in the soil, and is sometimes liable to collapse under the atmospheric pressure. The suction of the pump will also occasionally cause the tin lining of lead pipe to separate from the lead and collapse so as to close the pipe. Common gas-pipe of wrought iron is perfectly harmless, and, after a few months, becomes coated with rust so as to be altogether unobjectionable. This has the merit of being both cheap and durable.

The inquiry has been made, whether it was profitable to mix salt with lime for agricultural purposes.

I am not aware that any exact experiments have ever been undertaken to determine this question. The real value of salt as a fertilizer is a subject about which the greatest diversity of opinion exists among scientific men. Some believe it useful only to destroy insects and weeds, while others claim it to be a valuable special manure. Theoretically, it seems judicious to slack lime with brine, or to mix salt and lime before slacking with water. It is believed that a chemical reaction takes place by which caustic soda and chloride of calcium are formed. These are both very soluble and may be beneficial in supplying plant-food, and in absorbing moisture from the atmosphere, and soda must act as a powerful aid in decomposing both mineral and vegetable matter.

In reclaiming a swamp on the college farm, after underdraining with tile, and ploughing, an application was made of fifty bushels of oyster shell lime and five bushels of rock salt to the acre with very satisfactory results. The salt was ground in a plaster mill, and mixed thoroughly with the lime in the field. The pile was then slacked with water and spread broadcast.

On the whole, I incline to the opinion that it will pay to use salt in this manner, unless the chloride of potassium from Stassfurth can be obtained in its stead. As this is now imported, we may hope soon to procure it at such prices as will enable us to employ it as a fertilizer.

Adjourned to two o'clock.

AFTERNOON SESSION.

The Board met at the hour appointed, Mr. DAVIS, of Plymouth, in the chair.

The CHAIRMAN. This forenoon, Mr. Brown took occasion to say that the bone-black and refuse of the sugar manufactory had proved of no value agriculturally. After he left the hall, President Clark was understood to say that chemically they were considered of value. Mr. Brown would like to say one word upon the matter in order to explain it.

Mr. **Brown.** I do not wish to be wise above knowledge. I have no personal knowledge of the use of what is called bone-black. What I stated, I thought I stated guardedly. What I stated was what other people have stated to me, and if anybody inquires who stated these things to me, I have no objection to giving the names. I do not know that any person who manufactures superphosphate ever uses any foreign article of that kind. I never used a pound of sugar waste in my life. I only tell what was told to me. How is bone-black made? The bones are put into an iron retort, holding two or three barrels, which is covered with a tightly-fitting iron cover, and let down into a furnace. In a few moments, the whole becomes red-hot—the iron retort and bones themselves. In this way, all the oily matter is driven out of the bones, and passes off through pipes into another part of the building. After the bones are sufficiently heated in that way, the retort is hoisted out of the furnace and set away to cool, with the cover still fastened. When the bones are sufficiently cooled, they are passed into the mill and ground. All these processes I have seen myself, and that is the bone-black that goes to the sugar refiner. Now, if you took bone-black in that state and used it, I have no doubt it would have a fertilizing power, but when it has passed through the sugar refinery, it is another article. Whatever of value it has is used up in the process, and there is no fertilizing power about it. I should think there might be some fertilizing matter in the waste of the sugar itself, but that does not seem to be so, because it not only adds nothing to the fertilizing power of the bone-black, but destroys whatever it had originally.

FIELD CULTURE OF ROOTS AND VEGETABLES.

BY J. J. H. GREGORY.

My Farmer Friends:—I propose rather to talk to you in a familiar way, than to deliver a lecture. The subject is "Field culture of roots and vegetables." This comes mostly under the head of market farming, and I shall include under it in my remarks this afternoon, beets, mangolds (mangolds being but a coarse variety of beet), cabbages, carrots, cucumbers, potatoes, melons, onions, parsnips, pease, squashes, tomatoes, and turnips. Of course, I can pass but very discursively over so broad a field. I can briefly discuss them, under the heads of soil—preparation of it—manure—sowing of seed—cultivation of the plants—gathering of crops. I propose to speak of the roots first. These are beets, mangolds, carrots, parsnips and turnips. I will also classify with these onions, for although the onion is a bulb, the cultivation is analogous.

Of the Soil.—Of these roots, the turnip will accept the widest scope of soil, from sand down through muck and clay. When I speak of the turnip, I mean also the ruta-baga. Of course, I know the flat English turnip covets a sandy soil, whereas the ruta-baga does better upon heavy soil.

Next we come to beets and mangolds. These will grow on a sandy loam down to clay. It is well to remark, however, that grown on lighter soil, they are sweeter, and, as a general rule, it is the same with all vegetables, as with all grasses,—the lighter the soil adapted to them, the sweeter the product. I recollect some years ago a friend called on me to buy some mangolds. I took him out to a field where there were two lots, one on upland, the other on lowland. Those on the lowland were the largest and handsomest, and he said he would take those. I asked him to taste them. He tasted them, and found those on the lowland almost tasteless, while the upland mangold was almost as sweet as the common market beet. Of course, the more sugar we get, the more nutriment we get. Although these vegetables have the greatest scope of soil, still, they will thrive best on the soil best adapted to them, viz., a rather heavy loam.

The next in its scope of soil is the parsnip. This will grow on heavy soil to muck; it will not thrive on lighter soil.

Next, carrots. These will thrive all the way from sand to muck. On sand, as all our farmers know (I am telling old truths here), they are long, regular and handsome. On muck, if it is a dry season, they will be very forked. I never saw them on rocky land so forked as I have seen them on muck in a dry season. On rocky land, they will thrive, but it is very hard work to dig them, and they are forked. This kind of land, therefore, should be avoided.

Of all these roots, onions are the most limited. They will not do well on sand, and on clay they grow all the year round and do nothing. The only proper soil is a medium one, not very light nor very heavy, a gravelly loam. So much for the general requisites of soil.

Preparation of the Soil.—If the land is at all moist for either crop, underdrain it. If it abounds in twitch-grass or chickweed, it is wholly unfit for anything but a hoed crop. If it is very weedy, there is an immense amount added to the cost of production. Very weedy soils should not be put to a bed crop, unless the party is compelled to do it. Where the soil is very weedy, it can be prepared by ploughing it in the fall, turning over the land so early that the weeds will not have time to germinate, then go on with the cultivator, and then throw it up again. In this way you will get rid of a great deal of the weed seed. That is the only method for bed crops, strawberries and all such things, that require much care. It will be found best to give them up entirely, or destroy all the weed seed possible before planting.

Freshly turned-up sod is not suited for the cultivation of vegetables, except carrots and ruta-bagas. It is generally best to put them on the third year. The first year, the land is too rough ; the second year there is too much old, half-decayed turf, for in handling these vegetables you want everything very very fine. Carrots alone do very well, if the sod is entirely free from twitch grass, planted the first year. Ruta-bagas do very well on sod.

Of Manure.—The amount of manure for all these bed crops must be large. For beets, I should want somewhere about six cords ; for turnips, from four to eight cords ; ruta-bagas ought to have eight cords. I am stating the general rule. Of course, the quantity of manure required will vary with the condition of the land and the natural qualities of the soil itself. I consider that clay land does not need so much as lighter land. Carrots, eight to ten cords ; onions, from twelve to twenty cords.

Now the best way in which to present this manure to plants is in the form of compost, well fermented, and made very fine. On the seacoast, where we go largely into these crops, we have in our compost muck or clay, which has first been exposed, if practicable, to the action of frosts, rain and air for a season, night soil, collected from town and cities, kelp from our beaches, and barnyard manure. These four ingredients generally constitute our compost heaps. In forming this compost, as soon as our crops are out of the field, we generally make a bed of muck, eighteen inches or two feet deep, and then run up a ridge four feet in height, then send out our night-soil carts, as soon as law allows,—the first of November or December,—and we expect to put in about one-third as much night-soil as we have of muck; after that, we add our kelp, when it comes in, and also our barnyard manure, as may be convenient. These heaps are made even with the ridges. If, when all these ingredients have been filled in, the heap is not even with the ridge, we throw the ridge in. Then, just before the frost is out, for the early spring-time is very valuable, we go out with axe, pick, bar and fork, and pitch over the heap, throwing the coarse lumps outside, where the rains and the frosts can have access to them. We let it lie a week or ten days, and then pitch it over again; and, if we have time, we turn it over a third time. By that time we have had heat developed probably twice, and the manure has been very thoroughly comminuted. This is the general nature of our compost, of which, as I said, we use so many cords to the different crops.

We also use ashes, that have been so discussed here to-day: guano, fish pomace,—"chum," we call it,—and phosphate of lime. When we use the fish pomace, we make a layer of muck or clay, and then put on it a thin layer of the pomace; perhaps four times the depth of clay or muck that there is of pomace. I mean such pomace as has been discussed here to-day. The fish are boiled, the oil pressed out, and the refuse barrelled up and sold. Sometimes it is thrown into a vast pile and mixed when in a high state of fermentation. In the green state, when brought fresh to market, directly from the fishermen, it brings about twenty dollars a ton. It is landed on our shores at about that price.

In regard to guano, I use that mostly in connection with other manures. I use all of these substances, that is, the phosphates and guanos, but I depend mostly on the compost for the great bulk of my manure for roots and vegetables, and add these substances in the hill or broadcast, as may be convenient. While I am on guano, let me say, as a little addenda to what was said this morning, that one farmer in our vicinity has used it, I understand, for eleven years. That has been his great article; he has used scarcely anything else. I should expect that, used for so long a time, it would injure his land, and gradually reduce his crops, but instead of that, he has the reputation of carrying to Boston the best potatoes that go into that market. His success has had the effect to induce his neighbors to follow the same course. One of them was over to my place a year ago, when I was buying large quantities of stable manure. I asked him, "How much do you buy?" Said he, "I haven't used any for years." "What do you use?" "I use guano. I carry all my crops through with guano; two wagon-loads manure my farm." These are very cautious men; they have felt their way along, and they have used this manure for years without any injurious effects. I have known of men who have raised enormous crops for one or two years on night-soil, and everything seemed to be going on successfully, but all at once there was a break, the land baked up, and they were obliged to go back to stable manure to bring the land back to its former condition. I have known such things done on land in places where fish pomace was very abundant. My explanation of it is, that some stimulus is given, by which certain ingredients in the soil are exhausted. In these cases where guano has been used for a number of years, I presume the quantity used was not so liberal.

Application of Manure.—We apply the manure for bed crops either before ploughing or after ploughing. Our general plan, however, is, to plough the land first. If we can give it a full ploughing, we prefer to do it, unless it is an onion bed, already stuffed with manure; in that case we prefer not to plough in the fall, because a vast amount of the manure is likely to be blown off. In the spring, we do not plough as deep as in the fall. After ploughing, we cultivate and work the soil up very fine, then apply the manure, and then put on our small one-horse plough and turn that under, with very narrow furrows. Then the men follow with rakes, stretching off in a line, so that they can work easily, and make the bed as smooth as a floor. We then have a beautiful seed bed. If we desire to put on any phosphates or guano, we do it before the raking. I generally put on my onion bed four or five hundred pounds of phosphates to the acre, before the raking. Just as the horse gives the final ploughing, I have my men follow the plough and scatter the phosphates or the guano, and then the men rake it in. I may say, in regard to raking, that there is a great deal of difference in raking. Those who have never practised it are hardly aware what a difference there is. There is such a thing as raking a bed very fine and not very smooth, leaving it a sort of rolling prairie. When raked in that way, it is very hard for the seed sower to do its work properly. It is very important that the bed should be raked, not only fine, but level.

Sowing or Planting Seed.—We put our onion rows fifteen or sixteen inches apart; carrots, about the same; flat turnips, about the same; rutabagas, two and a half feet apart, so that we can get the cultivator between the rows. Of course, when roots or vegetables are raised on a large scale, machines are always used. There are various sowing machines. They might be classified as dropping machines, shaking machines, stirring machines and brushing machines. The dropping machine simply drops the seed down. It depends simply on gravitation. This machine will not sow well beets or parsnips, as a rule; it does very well with onion, sage and carrot seeds, when very clean; when there is any impediment, you want something more efficacious. The brush machine has a little revolving brush, which brushes the seeds out, preventing their clogging in the hopper. Then comes the shaking machine. The Danvers machine is a very good type of that. That machine jars or shakes the seed-box by means of a spring. That does very well for small seeds. Then comes the stirring machine; that operates by a stirrer or agitator inside, which keeps the seed in motion while the wheel revolves. That variety of machine I consider the best, as far as I have tried, for the stirrer plays right over the hole into which the seeds drop, and keeps them from bedding up. These machines need to be used with good judgment. It depends more upon the man than the machine, as a rule; and it is surprising what a difference it will make in the crop whether you have a first-rate man or a second-rate man to tend the machine. A few hours' work by a first-rate hand is sometimes worth ten dollars rather than to employ an indifferent hand, because the whole result depends upon it.

Tools.—I will run through the tools. We first use the wheel hoe. That is a hoe (I suppose most of the farmers are acquainted with it) running between two wheels. The great defect of those sold in the agricultural stores is, that the handle is not long enough, and the man is kept stooping over. It is very exhausting work. A man ought to be able to stand up, when the wheel hoe is used on onions. When the onions get somewhat large, so that the tops will not interfere with the hoe, then we use the slide hoe. I saw a very fine variety of that in Connecticut. There are varieties of these implements which are somewhat local in their use; some local genius gets them up. This one down in Connecticut consists of a series of half ploughshares set on a spring. I think it was in the form of a triangle. I tried to get one made, but the man had got out of the notion, and wouldn't make one, nor let anybody else undertake it, and so the thing dropped. There is one in our town, made by an old farmer named Wm. Goodwin, a man who has spent all his leisure hours in trying to invent something. He has got up a very good thing in the shape of a slide hoe. The great object is to get near the root, and avoid the labor of hand weeding. If we can get within an inch we do very well, but that has to be weeded over. If we can get nearer than that, we can save a vast deal. Mr. Goodwin has invented a very simple implement. He has done it by throwing the hoe back somewhat, and he can do as much by four slidings as others do in six. Then there is the Noyes' weeder. Mr. Noyes sent me some last spring, and I found my boys all liked them. It is a foot in length, lozenge-shaped, set in a little handle. It will save a great deal of work, especially where the ground is baked.

Quantity of Seed to the Acre.—Of onions, we plant from three and a half to four pounds. The old rule was three pounds; then we increased the quantity to three pounds and a half, and now we think four pounds none too many. Of carrots, if we could have the seed-bed in first-rate condition, a pound would answer, but that is a little risky. The seeds are very small, and therefore a pound and a half is safer. I see some seed-men recommend five pounds to the acre. I do not know what they do with them when they come up; indeed, I rather infer that they never expect one-half of the seed will come at all; it would take all the season to thin them out. Of turnips, somewhere about a pound.

Mr. BROWN, of Concord. How much beet seed?

Mr. GREGORY. Beet seed is a seed hard to come up, for this reason: it is of a somewhat large size, and it is apt to drop out rather irregularly, and it needs to go to a considerable depth. There should be as much as four pounds to the acre to make that safe. I should say they should be planted an inch and a half in depth, except the long, smooth, dark blood-beet, the seed of which is rather large; let them down two inches. If dry, add a little to the depth; if very wet, plant a little shallower.

After-Cultivation.—Now, we will suppose our seed sown and our plants beginning to appear above ground, how should we manage then? You understand that the whole bed is full of fermenting manure, and everything will grow fast. As soon as you can discern the rows, put in the slide hoe and have the boys follow the hoe, as soon as possible, on their hands and knees. You will find that the best cultivators are those who attend to these things earliest, and allow the smallest possible interval between the slide hoe and the hand weeding. Again, it is safer to weed when the weeds are very small, because you are not so likely to disturb the plants. If you pull them when they get large, especially in a dry time, you disturb the earth, and may disturb the roots of the plants.

Carrots come up slowly and need to be looked sharply after. It is rather difficult to see them. The man who weeds carrots should have an experienced eye, and understand what the carrot is. Therefore, carrots must be watched very carefully and the hoe run through carefully. Onions can be more readily seen. Sometimes people will allow weeds among carrots to get some little size before they pull them, if the carrots went in late and it is very hot, because a hot sun on young carrots sometimes burns them. That must be a matter of judgment.

We generally expect to weed our crops about four times. (When I speak of crops I mean the carrot, the onion and the beet, more especially.) We expect to slide them as often as that, and perhaps five times. This depends somewhat on the season. A very wet season, we expect to throw in one or two slides and hand-weeding also. Then we are careful not to allow any of the weeds to go to seed, and towards the close of the season the hands go through the rows with baskets on their arms, and pull all large weeds up and carry them out of the bed.

But in spite of all that, of course the great mass of our ground devoted to vegetables will run too much to weeds, especially purslane and chickweed. Purslane is the worst weed we have. Neither of these weeds is sufficiently understood. They are of a class that grow and seed at the same time, and they are very apt to deceive people in that way. Chickweed flowers earlier in spring than anything else. As soon as the snow leaves the ground you will find chickweed in bloom, and you never see the weed of any size where you will not find seed. Some people have an idea that it cannot be exterminated, simply from the fact that it has that habit of blooming all the time and going to seed all the time. This has been a very favorable season for chickweed. These weeds, therefore, are to be looked after. And how do some parties look after them? I once saw the hog-pen of a farmer, who had raised onions for years, three feet deep with purslane. I dare say every cord of that manure cost him twenty-five dollars, and more too. That is one of the greatest mistakes a farmer can commit—using weeds for manure. They are the most costly things a man can use. In the first place no man can afford to raise them That idea ought to be knocked out of every farmer's head. If you should take all the weeds you can gather and put them into your hog-pen, and count the time it takes you to get them there, you would find phosphates, at two hundred dollars a ton, cheap compared with them.

Gathering Crops.—The onion crop we begin to pull after the tops have died down. We aim to get the onion crop in as soon as we possibly can in the spring, because it needs all the season. The 10th of June is not very late for the carrot. The onion crop we gather, as I have said, as soon as the tops die down. If it should happen, unfortunately, that the land was not manured enough, so that they still hold their necks up stiff when the season threatens frost, then we have to break them down by hand or by rolling a barrel over them. After the tops have gone down and the necks are fairly dried, pull three rows and throw them into one, and so pass over the ground. Let them lie there two or three weeks. The first two or three days, let them be together; that helps decay the tops. Then give them a very gentle raking with wooden rakes. There is a great deal of damage done raking too hard and rough. Then they are taken into a shed and topped, or topped on the ground. If they are topped on the ground, they can be marketed without any handling.

Carrots are not so easily handled. There are several ways in which carrots can be managed. The common way is to take a digging fork and go along and start them, and then have a boy pull them. One boy can pull as many as two men can start. Another way is to take a subsoil plough and run it under the roots, after which some take them out with a rake, others pull them out. Another way is to take a slide hoe and slide the tops off, and then run the subsoil plough along. It makes rather rough work, but carrots will bear a little cutting. Some cut off a piece of the top purposely, thinking as this hinders sprouting the carrot won't rot so quick. When the season is long and they are planted early, there is this risk: they will sometimes begin to make a second growth. That is a critical time. If they do so it deteriorates the quality. It is apt to happen when the carrot has got nearly mature, after a long drought, and they have been checked in their growth; if then there comes a rain, they will start a new bunch of leaves, and on digging them you will find that they have made a great many fibrous roots. Such carrots will not keep as long, and the fibre is more woody. They have begun a second stage of growth. It is, therefore, unfortunate to have a bed of carrots start the second time. Sometimes carrots will go to seed badly. I do not know what the reason is. I do not think the seed has anything to do with it. The short horn carrots are more apt to do this than the long orange.

Varieties.—Of beets, there are a great many varieties. On the Continent they do not use beets for the table, nor grow them to any extent, except mangolds, which are raised for stock, and the Silesian white beet for sugar. We have a very good beet in Dewing's Early. That is a variety which has been started somewhere in the vicinity of Boston by a first-rate market gardener, and it is a very nice beet indeed. Simon's Early Turnip, a

Philadelphia beet, is a very early variety, very symmetrical, and excellent quality. It has a little deeper color than the Early Bassano. These varieties are characterized by great smoothness. Then we have the extra flat kind, which is very early.

Mr. J. F. C. Hyde. How about the Egyptian beet?

Mr. Gregory. I can't say. It does not seem to have the quality of our beets.

Mr. Hyde. It is the finest quality I raise.

Mr. Gregory. There are a great many English beets,—the Castelnaudary, Carter's Early, and so on. The great trouble with the English beets is, they are not suited to us. We want the turnip beet. I imported from England, one year, all the varieties I could find, and there was not a single good turnip beet in the lot. The Egyptian beet is very dark colored, and that is in its favor. Those that I have seen were not so large as ours.

The term "sugar beet" is sometimes used since beet sugar has become an article of production in Europe; it is an unfortunate term. The sugar beet is a mangold; it is not a table beet. The turnip beet is a *sugary* beet, but not a *sugar* beet. The sugar beet is an underground mangold, makes a very large top and rather a small bottom in proportion to the top. As a mangold, it is the most unprofitable kind to grow, but it is the kind we are very apt to get when we undertake to import seed from Europe. There *is* a white mangold which grows above ground. The rule is that no part of the sugar beet should be out of the ground. If it is, some chemical change takes place which is objectionable. It gives a vegetable taint or color to the sugar, which it causes some trouble to remove. Therefore, it is desirable that the sugar beet should grow under ground.

Of mangolds, we have the long red, and improvements on that. Among them is the Norbiton Giant. One of my neighbors grew a Norbiton Giant that weighed thirty odd pounds. The Norbiton Giant is characterized by growing freely out of the ground, without making so hollow a neck as that of the long red. You know the neck of the large mangolds is all lost. It is hollow, woody and good for nothing. That is one of the results where mangolds are planted rather early. Now, we can plant the Norbiton Giant earlier than the common red, without having that long neck to trouble us.

There is another class—the ovoid mangold and the globe mangold. The ovoid mangolds are oblong, as the name would imply, and they have this great merit—they grow very symmetrically, and with scarcely any small fibrous roots. One trouble with these roots is, that they catch up a great deal of mud and dirt, and it is difficult to get them clean. These ovoids are very solid and heavy, and have hardly any small fibres. The French think they are the best beets to grow. Of the globe mangolds, I do not know any special argument for them, but they are said to be rather early and to grow well on sandy soil. I cannot testify to that from personal experience.

Of Crops.—A first-class crop of carrots is thirty tons. Of mangolds, it runs as high as fifty tons. I saw one crop of onions of 936 bushels. But these are extreme crops. A very good crop of carrots is twenty tons. Five hundred bushels of onions is a very good crop. .Twenty-five tons of mangolds to the acre is a good crop.

Cost of Production.—I have figured a little on the cost of production. Some farmers do not figure on these things at all, and hardly know how they are coming out. Take an acre of carrots:—

Interest on land, ...	$25 00
First ploughing, ...	5 00
Harrowing, cultivating and brushing, . . .	5 00
Second ploughing and raking, ...	12 00
Seed, 1½ pounds, ...	3 00
Manure, and spreading eight cords, ...	80 00
Planting seeds, ...	1 50
Weeding, four boys, three weedings, two days each time, ...	24 00
Pulling large weeds, ...	1 00
Three slidings, ...	4 00
Digging, ...	15 00
Topping, ...	4 00
Wear and tear of tools, ...	2 00
Total, ...	$181 50

The average price of late has been $12 a ton. Estimating the crop at twenty tons, we have $240. Deduct cost of production, and we have about $60 left. If we have twenty-five tons we have $300, and $130 net.

Take an acre of onions :—

Interest on land,	$30 00
First ploughing,	5 00
Harrowing, cultivating and brushing,	5 00
Manure, and spreading,	100 00
Re-ploughing and cultivating,	8 00
Three hundred lbs. phosphate to rake in,	9 00
Raking, five men one day,	10 00
Seed, cost will vary, average,	15 00
Planting,	1 50
Weeding, four boys two days, at four different times,	32 00
Sliding and wheel-hoeing,	8 00
Pulling large weeds,	4 00
Pulling crop, two men a day,	4 00
Raking crop to cure it,	4 00
Carting to barn,	10 00
Topping,	12 00
Wear and tear of tools, &c.,	2 00
Total,	$269 50

Then there is to be added the cost of marketing, which will depend upon how far you have to go. It will cost to produce an acre of onions all the way from $250 to $300. Two hundred and fifty dollars is the lowest point I can put it at, giving the crop such treatment as it ought to have. If the yield is 400 bushels, at $1.25 a bushel, that is $500. Deduct expenses, say $300, and we have $200 left. From that is to be deducted the cost of marketing. The profit will be all the way from $150 to $300, where we have what we call a fair crop.

We hear of great crops sometimes. Thirty-two tons of carrots! Why don't that man repeat himself? Nine hundred bushels of onions! Why don't he do it again? He cannot. These extreme crops are beyond our reach. Suppose a man does all he can, is he not dependent upon the weather? It may be too hot or too dry or too cold or too wet a season. These are uncertain elements, over which he has no control.

So much for the root crops. I will say a few words upon other vegetables.

For the squash crop, we want a warm location, warm soil and plenty of manure. As a rule, all crops that have broad leaves want plenty of nitrogen. We want, therefore, rich, strong manure for squashes, plenty of night-soil, plenty of barn manure, plenty of guano. Kelp does not seem to be adapted to squashes. It does very well for carrots, first-rate for cabbages, and several other crops. For squashes, we want about as liberal a supply of manure as we should have for carrots. I have seen twenty cords put to the acre, but in that case the man did not get enough back to pay for five cords. But the difference between heavy manuring and the common way of manuring may sometimes make all the difference between a good crop and no crop at all. How? Why, in this way. Suppose the season is dry, as it was last year, and unpropitious for crops. If the land is very heavy with manure, the plants will hold their own through the extreme drought, and grow when the drought is past. You and I saw some crops dry up and disappear last summer, whereas others, where the land had been heavily manured, barely holding their own while the drought lasted, as soon as it broke, went on and produced a good crop. I know one man in our section who got thirty tons, where he only expected to get ten or twelve, which sold for from $60 to $100 a ton, so that his extra manuring paid him enormous returns.

We like new land for squashes, because it is generally more free from the striped bug and the black squash bug. It is a singular fact, that wherever we have given up pumpkins wholly, that large black bug which we used to fear so much has almost wholly disappeared. I have not seen one for two or three years. The little striped bug, which we do not fear so much, is sometimes a great pest, and this year I had more trouble from the striped bug than for the past nine years. I had to keep one man most of his time sprinkling the leaves with lime and plaster. I do not like lime so well as plaster; it is apt to be a little acrid and burn the leaves, especially if there is rain just after it is applied. When we use it, we get it well air-slacked, so that the rain will not act upon it. We scatter it on in the morning while the dew is on. Sometimes these bugs will take half an acre in half a day. We wish to hurry the vines in their growth, to get them beyond injury by the bugs. That is one reason why we like to manure them in the hill. Put in the compost broadcast, and reserve the guano, the hen manure and the phosphates for the hill. I make this rule, and where you have Irishmen to deal with, it is a very good rule. I take my hand full of guano, scatter it over a place about eighteen inches in diameter, and then a man follows with a fork, and turns it under about four inches. I excavate no hills at all. I have given that plan up. I don't approve of putting the manure for heat-loving vines down in cold holes. The idea is to stir about twice each way, and have the man finally put his fork in the middle of the hill and give it a twist. You cannot leave it to their judgment ; you must have a rule.

We plant about half a dozen seeds to the hill. When they get up, so as to show the third leaf, we thin out to three or four in a hill ; but we finally thin out to two in a hill ; and if it were not for the borer, which sometimes plagues us, we would not leave but one in a hill. We plant the squashes at right angles, so that we can run the cultivator through easily. We follow that with a hoe. We do not, as a rule, pull the earth round the vines. If we find one that wants support, we just support it. We do not dig any holes, and do not make any hills. I recommend neither digging holes nor hilling. It saves a great deal of work, and work that is not necessary. The habit of the squash-vine is to send out its roots near the surface. They want the heat of the sun, and where the roots have their choice, they run just as near the surface as they can. But if you make a hole and fill it up with manure, of course the roots will go down after it. With onions, when we come to the final ploughing, we don't plough more than four or five inches deep. The idea with onions, as with most of our crops, is not to have the manure go too deep.

In regard to gathering the crop, the farmer must exercise judgment about that. When the squash is about ripe, let the boys go along with a knife and cut the stems. They rot badly when left out too long, exposed to wind and storms. Therefore, we only let them stay out a day or two. In fact, I have the men go and cut them and give them a turn over just where they grew, and there they lie until I finally gather them.

In regard to pease, I want to make a single remark, and that is, the more dwarf the pea, the more highly they should be manured. When you come to the very dwarf pease, give them as much manure as possible. That is where you may make a mistake. I think it may be laid down as a general rule, that the dwarf varieties are the ones that require the most manure.

We call the Turban the best fall squash, and the Hubbard the best winter squash. The Turban varies more than the Hubbard, but when you get a nice Turban, you will find it the best squash. The Turban squash has sold this fall for $100 a ton, the Hubbard for $80. The Marrow squash has not brought anywhere near these prices, so far as I know. We call five tons of Hubbards a decent crop, six tons a good crop, eight tons a very good crop. I have known eleven and a half tons raised, but that is very exceptional. I have grown fourteen tons of Marrows to the acre. This year the squash crop has been very poor, as you all know. I had about four and a half tons to the acre. I think that is above the average. I do not think they have averaged much over from two to three tons, take the country round.

I think I omitted to speak of carrots. The carrot can be classified under three or four heads. I ask myself what I want to raise them for; whether I want them for the general market or for stock, and if for stock, whether for horses or cows. If for the market, I should raise the short-horn carrot. The long Surrey carrot is generally raised for market, but it is not so sweet as the short-horn carrot. If any man has never tried them, he will be surprised at the difference. People who have never liked the carrot, when they try the short-horn often find it very palatable. For cows, you want size, and you will raise the improved long orange, which is a very bulky carrot; it has a shorter top and does not grow as long as the long orange. Thirty-six bushels will weigh a ton; but it takes forty of the long orange. For horses, the white Belgian is a good carrot. Its merits are, that it produces enormous crops, and grows partly out of the ground, so that you can pull them without digging, when they are of enormous size. If you feed carrots to milch cows, you want to have the milk colored somewhat, and the orange carrot will do that. To color butter the Altringham or Early Forcing carrot is best.

A few words on cabbage. We prefer to take the best land for cabbage. It used to be thought that the only cabbage land worth anything was heavy clay land, or wet land. That is not so. Any good corn land is good cabbage land. The Winnigstadt will grow even on sandy soil. It is the most persistent heading cabbage we have.

In growing the cabbages you must take into account that they are very hearty feeders. They want plenty of nitrogenous manure, and phosphates too. We want for a first-class crop of Marblehead Mammoths, twelve cords to the acre, and in addition to that, we manure somewhat in the hill. Over our way, we generally grow the Stone-mason and Foltler, and these are our standard for the general market. There is no cabbage that gives so much satisfaction as these. They are very uniform in shape, and make a very large head. Our Stone-mason cabbage is an excellent cabbage. It is earlier than the Flat Dutch by a fortnight, and grows a better shaped, harder and sweeter head.

Of Savoys, we generally grow the Green Globe Savoys. That is our standard. It has been so perfected that for heading it is as reliable as our Drumheads. We have also some very early Savoys, as early as the Early York. There is a very nice cabbage, called the Schweinfurth Quintal. It will not stand marketing, because its head is very tender, but it is one of the best cabbages I know for the family. The head is very large, not very solid, and so tender you could push your hand through it. It is excellent for cooking. For early cabbages, we grow the Wyman, the Jersey Wakefield and the Winnigstadt, and there are one or two other kinds that may amount to something.

QUESTION. How many heads per acre?

MR. GREGORY. That depends upon the distance they are apart. All the way from four to twelve thousand.

MR. HOWE, of Bolton. I noticed that you gave us the estimated cost and profit of raising some of the root crops, but you have not said anything about the cost and profit of raising cabbages.

MR. GREGORY. I have not the figures here, but generally we should not go much outside of $150 to the acre, as the cost of the crop.

MR. HOWE. Did you ever make any money raising cabbages?

MR. GREGORY. I raise mine for seed.

Mr. Howe. I think you are wise there, sir.

Mr. Gregory. Some of our best farmers, as a matter of profit, would almost as soon think of giving up their onion crop as their cabbage crop; no doubt an abundance of sea manure at their command has something to do with this.

FRUIT CULTURE.

BY CAPT. J. B. MOORE, OF CONCORD.

Mr. President:—In discussing the cultivation of fruits, their value to the public and to the producer should be carefully considered.

And with that view, and to show their estimated value, I have examined the returns made to the State by the officers of each of its cities and towns, and published in the year 1865.

And according to the estimates there made, the value of the apples and pears grown in Massachusetts amounted to one million seven hundred and thirteen thousand two hundred and forty dollars. In these returns the value of all other varieties of fruits are not estimated. Their value would be as much as five hundred thousand dollars, which added to the amount for apples and pears would make the whole amount to two million two hundred and thirteen thousand two hundred and forty dollars.

These estimates for apples and pears were made in the year 1864, and the apple crop that year was nearly a failure, and therefore the amount estimated is not as large as it ordinarily would be.

The farmers of Massachusetts gathered but three other crops the same year that exceeded in value the fruits, viz.: the crops of hay, corn and potatoes. I have called your attention to these returns to show the importance of this interest. Another decade, with the returns made in a year having a good crop of fruit, will probably show the fruit crop second only to the hay crop in a money value, and for this reason if for no other, that while the quantity of corn and potatoes consumed by the same number of persons has not increased for many years, and probably never will, the quantity of fruit has and will increase for a long time, and fruit which has by many been regarded simply as an article of luxury, will take its proper place in family economy as a necessary, healthful and palatable article of food;

this will cause an increased demand for fruit for years to come, which I trust will be supplied to a large extent by our own cultivators.

At the last public meeting of the State Board of Agriculture, held at Pittsfield, it was seriously urged by the most prominent agricultural lecturer in New England, that we must give up the growing of the apple; that from the change of climate, the ravages of insects, the exhaustion of our soils, apples could not be grown here in Massachusetts, except perhaps by skilful horticulturists, and that in his lectures to farmers in Worcester County he had advised them to cut down their orchards.

Now let us examine the results the present year and see if the climate has changed, the soil become exhausted and all the apples destroyed by insects. What are the facts? Why that we have gathered an enormous crop of apples the present year; and if the gentleman's propositions were correct, we have gathered them with an unsuitable climate, and from an exhausted soil, and in spite of the ravages of insects.

Now if this is correct, is there anything hereafter impossible in fruit culture? And I think I can say that almost every apple-tree with a particle of life in it has been loaded with fruit, no matter where situated, in the garden of the horticulturist, the orchard, pasture or brush lot of the farmer. Science or horticultural skill did not have anything to do with it.

And to me it does not look as though the climate and soil of Massachusetts, one of the homes of this indispensable fruit, the soil which has produced those world-renowned varieties, the Roxbury Russet, Baldwin, Porter, Williams, Hubbardston Nonsuch and many others, had entirely run out and lost its productiveness.

A few years ago there were doubts about growing even the most hardy varieties of grapes in Massachusetts. Now there is none whatever, and from my own experience I can say that it does not require anything more than ordinary skill to succeed. Select a warm soil, tolerably free from frost, and plant good vines of hardy and early varieties, and with any decent treatment they will produce a crop of fruit. It has been said by eminent horticulturists, that we must give up growing the peach, and the principal, if not only reason assigned for its failure, was the destruction of the forests which have so changed our climate, and made it so bleak, arid and unfavorable to this semi-tropical fruit that we could not grow it. What are the facts about the removal of the forests? As near as I can ascertain, and from my own observation, the old growths of woods which have been cut, have been constantly replaced by new growths, and by old pastures running up to wood, and that to-day there are many more acres of woodland in Massachusetts than there were thirty years ago, when peaches were grown here in favorable years in abundance. And although the forest trees now are not of so large a size, but being young and vigorous, they have a larger surface of leaves than the growth of trees removed.

It does not look as though this was the cause. Peach-trees, when highly manured and grown very rapidly, have always been liable to suffer to some extent in the winter in Massachusetts; but who ever heard of such a thing as orchard after orchard disappearing, until within the last few years, when attacked by a disease known as the yellows? And although there have been many theories advanced, no one has yet been able to give a good and satisfactory reason as to what causes, or what will prevent, or cure a tree once infected with it.

This disease, I am happy to say, appears to be passing away from us here, as it has in the State of Delaware, and I have no doubt that we shall again grow this fine fruit as formerly. I found my opinion not only from the fact that my trees are healthy and promising, but that within fifteen miles of this place (Framingham) they have been produced for the last five years with fair success and in considerable quantities for market. With these few remarks about the larger fruits, I will leave them to be discussed by many here who I know are so well qualified.

But before I leave the subject, I would like to call your attention to what are usually called the small fruits, the importance of which for home consumption and for market purposes I fear has never been appreciated. The strawberry, raspberry and currant are all easily grown, and ought to be abundant in almost every family as an article of healthy, palatable and cooling food, ripening as they do in the hot season of the year, when other fruits are scarce. Their abundant use promotes health, and perhaps may keep the doctor from your door. I am engaged to some extent in growing these fruits for market, and for the purpose of satisfying myself as to the best and cheapest method of cultivation. I have tried almost every plan recommended. Some of these methods of cultivating the strawberry I will describe. 1st. The matted bed or annual system. (This is sometimes called the Belmont system in Massachusetts.) The ground being well prepared, the plants are set out in rows from three to four feet apart, and from ten to fourteen inches in the rows, as early in the spring as possible after the soil becomes dry enough to plant.

The weeds are kept down between the rows with a horse and cultivator until the runners from the plants begin to spread ; the ground is then levelled with a rake and the runners spread out evenly over the whole ground, which will be entirely covered by the first of October following if the season has been favorable. The following spring, paths one foot wide are cut through the lot, leaving it in beds about three feet wide. After the crop is taken the lot is ploughed and used for some other crop.

The advantages claimed are, first, a full crop ; second, that it is less work to raise a new bed than to weed the old one, and although only one crop in two years, it is more profitable. The objection to this plan is the great expense of weeding, which after the runners have commenced to grow, has to be done almost entirely with the strawberry fork and the fingers. And the liability of having the plants too thick in the bed, which would injure the crop even if they were thinned, for having been grown thick they are not as strong and stocky plants as they otherwise would be. And also from having only one crop in two years.

This method, however, is perhaps well adapted to varieties like the Hovey's seedling, that seldom have but one fruit-stem to a plant, and therefore must be grown thick to secure a crop.

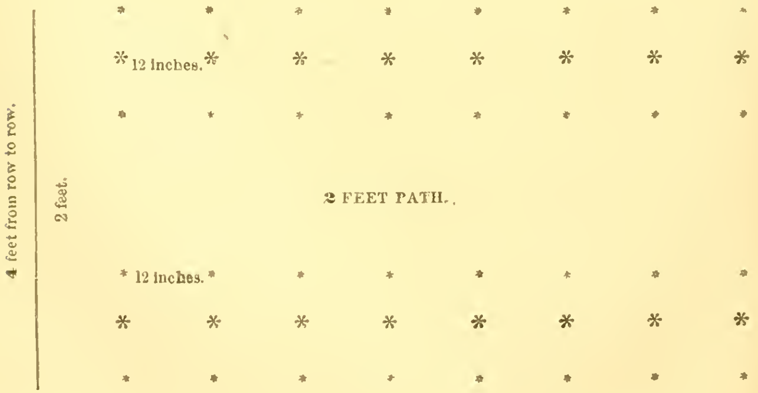
2d. To plant in the spring in the same rows as the annual system, except the rows are to be only three feet apart; and the plants allowed to cover a space one foot in width. This is a modified form of the matted bed system and is liable to the same objections.

3d. Single row or hills. This is setting out plants in the spring in rows three feet apart and the plants from twelve to eighteen inches apart in the row ; the runners are to be cut off and the plants kept in hills. The weeds between the rows are to be kept down with a horse and cultivator.

The crops grown in this way are of good quality, although not so large as they would be with the rows nearer together, and with the objection of a very wide space to mulch.

4th. Single rows two feet apart, plants twelve to fifteen inches apart in the rows, according to the strength of the variety, runners to be kept off, and the whole work to be done by hand culture. Under this method and high manuring very fine crops of large fruit are produced and the plants will bear from two to four crops without renewing—depending somewhat upon the variety grown. The objection to this plan would be the necessity of using only hand labor.

5th. Planting in the spring in rows four feet apart, and twelve to fourteen inches distant in the row, according to vigor of the variety. The weeds are to be kept down between the rows with a horse and cultivator until the runners start, which will be early in July. The spaces between the rows are then to be levelled with a rake, and two runners from each plant, one on each side, are to be laid in, directly at right angles with the row and about one foot distant from the original plant, and all other runners are to be kept cut off both from the old and the new plants. When the new plants have become rooted the strings by which they are attached to the old plants are to be cut. You then have a bed with three rows in it one foot apart, a space between the beds of two feet. The overhang of the leaves will reduce that space to about one foot, which will be the path for the pickers. This perhaps will be better understood by reference to the following diagram :—



I claim the following advantages for this method: first, that being grown at regular distances, and so far apart as to allow the use of a small onion hoe between the plants, and a small horse cultivator in the paths between the rows, you are enabled to substitute the hoe and cultivator for the weeding fork and fingers, and that the weeds can be kept down on four beds arranged in this way easier and better than on one under the matted-bed system; and that you have not left it to chance, but you have placed the plants at the precise distance apart most favorable to produce a crop of large and fine fruit; and that the same space will produce more fruit, and with less labor than by any other method named; and by proper care and manuring, will produce from two to four good crops without renewing the plants.

Now all those methods that I have named amount to nothing without a well manured and well prepared soil; and such persistent cultivation as will allow no weeds to grow; and the setting of good plants that have not been dried, soaked, and exposed to the air in our markets, until a portion of the roots are injured.

Therefore, good and clean cultivation is the only desirable or profitable plan to follow.

Colonel Wilder. I did not intend to say a word on this subject, although I have been somewhat familiar with it for forty years. But I suppose I am the person to whom our friend has referred in relation to the peach. He has certainly given us a most capital lecture. There is no man in this assembly, or in the State of Massachusetts, who can compete with John B. Moore of Concord, in the culture of small fruits. (Applause.) I think he possesses as much practical skill,—and that is what science is built upon, as any man in this assembly, to say the least. He is one of those rare men who contend with nature, and will not submit to defeat. But, gentlemen, where will you find another such example?

Now, that is the skill that always succeeds. Mr. Moore has given you instructive lessons frequently, and they are worth remembering. This is another example. He is sensitive on this subject. He believes that men can succeed. He believes that, with the same intelligence which he possesses, and the same determined purpose, every one can succeed. And so do I. He has felt sensitive in relation to the prophecy of our distinguished friend, to whom he alluded [Dr. Loring] in relation to the apple crop, and I think, as the last season has proved, he has got rather the better of the doctor. But in relation to the peach crop, as a crop for general cultivation, with the expectation that it will succeed, as it did in old times, I think, with due deference, he has taken for granted what he has not yet proved. I am as anxious to have you cultivate the peach as any man can be. I have been cultivating it for forty years. It is very seldom I get a crop, and I believe the reason to be, as I said last year, the removal of the forests (and that reason has been assigned by gentlemen of far greater intelligence and science than myself), which has had such an effect upon the atmosphere and the temperature, that the peach cannot succeed here. It certainly has not succeeded here at the North, of late years, as it did fifty, sixty or seventy years ago. There are exceptions. As the gentleman has said, peaches have been raised here in certain sections in quantities, but they have not been raised around Boston in quantities. I remember that in the town of Walpole, in my own county of Norfolk, fine crops of peaches were raised for years, and it was supposed that they could continue to raise them ; but they failed, and nobody cultivates them now.

Not to prolong my remarks, I hope every gentleman will be encouraged by what Mr. Moore has said. Try the peach. Plant it as you do your corn. You will get your crop sometimes ; but I don't believe we shall ever see the crop of peaches in this region,—where our fathers used to get them as plenty as potatoes, without any care,—come round again so that their cultivation will be successful for a series of years. I hope it may be.

Now in relation to the importance of the fruit crop. I alluded to that subject in the opening remarks which I had the honor to address to the Board. I am glad to know that Capt. Moore's opinion agrees with mine. I think it is going to be one of the most important crops in Massachusetts ; second only, as he says, to the hay crop. And, gentlemen, let us believe that this branch of farming can be made just as profitable in Massachusetts as it ever has been, and as profitable as it is anywhere else. I believe the method of cultivation is to be different in future from what it has been. We are told that the old homesteads are being vacated, and the land running up to wood. I tell you, gentlemen, that the sons who have left those homesteads have taken up special branches of farming, and are reaping better profits. They are bringing their vegetables to market in the quantities that Mr. Gregory and Capt. Moore have told you about. They have come to the lines of railroad, in closer proximity to the markets; they have not gone out of the world. I think the statistics will show in the future that farming is as profitable in Massachusetts as it ever was.

Mr. J. F. C. Hyde, of Newton. I desire to say a few words in regard to the culture of the apple. It is a subject of the highest importance to the Massachusetts farmer and fruit grower. I seize this opportunity to say a few words in regard to apples, because the opinion has been entertained for the last three or four years, that our apple crop was to be a failure, and that Massachusetts could not successfully compete with New York and the States further west in producing this crop, which I think is a great error.

I am aware that in Belmont, and other places about Boston, some of the farmers have done just what our friend Dr. Loring advised them to do—dug up their trees, or cut them down. I do not blame them. They cannot afford to pay a thousand or twelve hundred dollars an acre for land on which to raise apples, unless they raise varieties like the Williams or the Gravenstein, that are carried into market week after week, and sold at high prices. I do not blame them for digging up their Baldwin and other apple-trees, producing winter fruit, because they can use that land for strawberries and for market gardening to very much better advantage. That is all right. I have done the same thing myself. I have cut away magnificent trees, of thirty or forty years' growth that had just come into bearing, and I have dug up the roots, and cleared the land of those trees. Why? Because my land is too valuable to grow apples. But it will not be denied, I think, that Massachusetts produces better apples than are grown—I was about to say—anywhere else; and so far as my knowledge goes, it is true. If you go to Maine and Northern New Hampshire, you get an apple that keeps too long, and never ripens up to an excellent quality.

You go to the extreme West, and you get an apple of enormous size, but it is very soft and flavorless. That is true of all the varieties of apple cultivated there, to a considerable extent. Western apples lack the flavor that Massachusetts apples have. I have never seen any apples grown anywhere, that were equal to Massachusetts apples for excellence of flavor. They are not so large as Western apples, but larger than the Maine apples.

Then, again, there is no fruit so generally consumed and so important as the apple. I raise a few pears, having some 110 or 115 varieties, but not a twentieth part what my friend Colonel Wilder has. I have a pear orchard of some five or six hundred trees. I do not want to discourage any one from raising that very excellent fruit. Raise it in your gardens, and about the cities, where it does well, and supply the market. But pears do not compare with apples for culinary purposes. You can hardly sell cooking pears. People do not bake them or stew them, or cook them in any of the great variety of ways that the French do; but we shall grow to that. But apples are used in a variety of ways; you could hardly do without them; and for the last three or four years, when apples have been a partial failure, some of us have paid six, eight and ten dollars a barrel, and made up our minds, that as long as we could earn the money, we could not do without them, and would not do without them.

Now what shall we do? Shall we annually send thousands of dollars to Western New York and States further west for this fruit, not only buying the apples and sending our money out of the State, but paying for the barrels, many of which are wasted afterwards and the money lost, when we could just as well raise them ourselves? I say that is wrong. We ought not to purchase what we can produce profitably. There are many things we can purchase and had better purchase than raise. I had the notion that corn was one of them, but I have changed my mind on that since I heard the address of Dr. Nichols. Wheat is not one of them. I have raised first-rate wheat here, and you can raise it just as well. You can raise rye every year.

If what I have said be true, shall we not produce apples in this State? There is no difficulty about it. You can just as well grow apples as oak-trees. Do you ask me where and how?

I say, don't plant your trees on land in Boston or in the immediate vicinity of Boston; you can't afford to do it; but all the way back on the hill sides you can buy splendid land for apple-trees, for twenty-five or fifty dollars an acre—and not a great many miles from the cities either. You have got a great advantage over the West, if you send all your fruit to Boston, because, instead of sending it four, five or six hundred miles, you have only to send it fifty or a hundred miles, or a hundred and fifty, if you send it the whole length of the State. Even if you go back fifteen or twenty miles from a railroad to-day, before your trees bear this whole State is to be cut up with railroads, and the cars will be running right by your orchard. Perhaps you will say then your land will be too valuable to keep your orchard. That may or may not be, but I say plant your trees there. This year has satisfied you, as it has me, that you can raise apples in abundance. They are not sure—what crop is absolutely sure? But, taking the seasons through, you may be reasonably sure of getting your crop. This year, it is said (I hardly believe it), that owing to the shortness of water down-east, they have run their mills with cider!

Colonel WILDER. Did you ever know a season when apples were not produced in gardens?

Mr. HYDE. No, sir. I can remember forty years, and I have never know a year when we have not had apples on our place. I say, with locations well selected, and ordinary culture, you will not fail once in ten years. On the average, right through, it is as sure as almost any crop you can plant.

Then, judiciously select your varieties, put in your trees and take care of them. If it is worth doing, it is worth doing well. There is no crop that will pay you better for your trouble. The raising of apples is one of the most profitable branches of farming to-day. With the exception of market gardening, and the raising of small fruits about the cities, I believe it is as profitable a branch of farming as any one can engage in.

I say this much in favor of apples, because I feel a deep interest in this subject. I have visited almost every town in this State and in New Hampshire, and know, I think, what I am talking about. I have made trees my study all my life; I know something of fruit culture, and I do not hesitate to say what I do say.

Mr. Dickerman. One objection that is raised by farmers in regard to apples is, that when they are plenty, they are not worth anything. Now, can you control the bearing of apples? For instance when the apples set, can you pick them off, and be sure of having, next year, what would have grown this year, if you had not picked them off?

Mr. Hyde. I don't think it pays to undertake to change the bearing year. The Baldwin bears only alternate years, and it so happens that most of the Baldwin trees bear the even years; but we have Baldwin trees, and from those we have propagated largely (I have no trees to sell now, I am out of the business), that bear the odd years, so that we have as good a crop of Baldwins in odd years as most farmers have in even years.

In regard to changing the bearing year, I know it was done in one instance. We had a crab-apple-tree from which all the fruit was stripped the bearing year; it had time to get a start, and next year it bore fruit, and has continued to bear odd years ever since. But I don't think it would be profitable to attempt to do that. Make the best effort you can to get a crop, and then take what nature sends you.

Question. What is the retail price of apples?

Mr. Hyde. $2 and $2.50; choice, $3; fancy apples, $3.50 and $4.

I would say to those living rather near the city, if you want to go into apple culture, and have any old Baldwin trees or anything else you want to graft over, I will tell you what you had better do, and it will pay you full as well as pear raising. Put in the Williams apple,—one of the handsomest apples there is. Put in the Gravenstein,—one of the finest apples, and very handsome. You can get them into the market before any of the Western apples can get here. Mulch your trees with meadow hay or something of that kind. The Williams should always be allowed to ripen on the tree; they are like the peach in that respect. Mulch your land so that they will not be bruised when they fall from the tree. I have seen the Williams apple sold for six dollars a bushel. They will bring from two dollars and a half to three dollars any time.

Mr. Alex. Hyde. What is the best mode of manuring an orchard?

Mr. Hyde. In the first place I trench my land—work it deep; then I spread my manure—largely at first, when my trees are small. Then I have the habit (some condemn it), of putting three or four wheelbarrow loads of compost—no strong, unfermented manures—round the base of the tree in the fall. That I let remain during the winter. It serves to support the tree, and keeps away the mice. There is no straw among it, so that it affords no harbor for mice, but keeps them away. Then early in the spring I take that manure and spread it broadcast over the land, give it a light ploughing, not so as to disturb the roots, and then it is washed in by the spring rains, and the roots of the trees seem to get it.

QUESTION. Did you ever try wood ashes?

MR. HYDE. I regard wood ashes as one of the most valuable manures I have ever used; but it is difficult to get them, and the price would be very high. I have used bone dust with very good results, but it costs so high that I have not used it much.

QUESTION. What do you do with the canker worm?

MR. HYDE. I have lived within seven miles of Boston all my life, and I never saw a hundred canker worms on my trees. When over in Brighton, there was not a leaf on the apple-trees, the foliage on my trees was as fine as you ever saw. They do come, and they are a nuisance, I grant you, but they pass by. The most effectual preventative I find is a mixture of tar and printer's ink, but you must follow it up. And a very good thing to put around the base of the tree, is a little trough of iron or wood, filled with kerosene oil, with a little protection over it, to prevent the rain and leaves from getting in. It is sure death to them if they attempt to cross it, and none cross unless they are so numerous as to pile right in, hundreds on hundreds, and form a bridge over which some can go. I have seen half a hatful on a tree, within two feet of space. But then, let that not discourage anybody from growing apples. There is nothing to be had in this world, that I know of, that is worth anything, without some difficulties. There are difficulties in the way of everything. There are some in the way of growing apples, but no more than there are in the growing of other kinds of fruit. The canker worms remain but few years and can be successfully fought.

QUESTION. Will it pay to keep the canker worms off?

Mr. HYDE. Yes, sir. It won't do to let them eat your apple trees up.

Mr. JOHN JOHNSON, of Framingham. The committee to prepare suitable resolutions in regard to the death of JAMES THOMPSON, the member of the Board from Nantucket, report the following:—

Resolved, That the State Board of Agriculture learn with deep regret of the death of our esteemed associate, JAMES THOMPSON, of Nantucket, and pay the tribute of deserved respect to the memory of one whose enthusiasm, enterprise and personal worth had endeared him to our hearts.

Resolved, That we tender our heartfelt sympathies to his bereaved family, and that the Secretary be instructed to transmit to them a copy of these resolutions.

Mr. L. H. BRADFORD, of Fitchburg. I would like to say one word. I knew Mr. Thompson, and was pained to learn of his death, as I did for the first time last evening. We could better have spared another man. What shadows we are, and what shadows we pursue. Here to-day and gone to-morrow. Farewell, dear friend, farewell!

The question was then put on the resolutions, and they were carried.

On motion of Mr. Slade the Board adjourned to seven o'clock.

EVENING SESSION.

The Board again met at seven o'clock, Hon. CHAS. G. DAVIS, of Plymouth, in the chair.

Mr. GOODMAN, of Lenox. *Mr. President, and Citizens of Framingham,*—I am requested in behalf of the Board of Agriculture, to tender our thanks for the hospitality we have received during our stay here. At the opening of the meetings Mr. Brown in behalf of the Agricultural Society, Mr. Esty, in behalf of the private citizens of Framingham, and Mr. Johnson, in behalf of himself and others interested in agriculture, said that they should tender us all the hospitality in their power, and strive to make our stay pleasant among you. They have amply redeemed their promise. We have greatly enjoyed ourselves here, and those gentlemen, with the Messrs. Sturtevant, Ellis and others, whose names I cannot now mention, have done all in their power for us while we have been here. As strangers, we have been "taken in," not in the Yankee, but in the scriptural sense, "and done for," and last evening we were done exceedingly *Brown!* (Laughter and applause.) In behalf of the Board, I again tender our thanks for what we have enjoyed, and trust that the only ill result which shall follow from our presence here may be that you will see us again.

The CHAIRMAN. *Ladies and Gentlemen*,—It is said that Alexander the Great wept because he had no more worlds to conquer. We have with us to-night a gentleman devoted to the interests of peace, who has spent a long life in subduing nature this side of the Rocky Mountains, and I understand that he has found a new world to conquer beyond. I have the pleasure of introducing to you the Hon. MARSHALL P. WILDER.

CALIFORNIA:

A COMPARATIVE VIEW OF HER CLIMATE, RESOURCES AND PROGRESS, WITH OBSERVATIONS MADE IN A RECENT TOUR TO THE PACIFIC COAST.

BY HON. MARSHALL P. WILDER.

California is a wonder! wonderful alike for the wildness and grandness of her scenery, for the richness of her mines, for the fertility of her soils and for the salubrity of her climate,—a climate as delightful and healthy as any upon which the sun ever shone; a soil in whose bosom most of the products of the habitable globe find a congenial home; and a country overflowing with the bounties of Providence, where God and nature seem to have set their seal as the garden of the world. The fertility of her soils and the salubrity of her climate must always exercise a powerful influence on the prosperity of her agriculture. In most parts of the State no buildings are needed for stock, and none for the storing of the crops; and the bags of grain during the summer months are allowed to remain in the open field until removed for shipment.

Why the resources of such a country as California were not earlier developed seems to our finite minds a mystery. But the marvellous workings of God's providence are now clearly seen. Thus when the balance of trade against our country became so large and continual, thereby causing periodical revulsions and distress, then the gold began to glisten in the streams of California; when the forests became denuded of wood, then came the discovery of coal and the working of the mines; when the whale was being exterminated for the production of oil, then came the discovery of oil in the bowels of the earth instead of the bowels of the sea; and when the fertility of our great wheat fields, moving continually west, began to decline, California comes to the rescue with the golden harvest of her immense valleys, rivalling in importance the treasures of her golden mines.

Wheat is the great crop of California. More than one-fourth of the cultivated land is devoted to it; and so fertile is the soil that frequently the grain which is dropped in harvesting produces another crop without sowing or tillage. This is called a "volunteer crop;" and although it often yields fifteen bushels to the acre, it cannot be considered a judicious method of farming. Barley and oats are raised to considerable extent, but Indian corn was seldom seen in our travels. The annual grain crop of California is about thirty-two millions of bushels, two-thirds of which is wheat. In favorable seasons the average yield of wheat is about twenty-five bushels to the acre. Instances, however, are not uncommon where in new and very fertile locations it has reached fifty, and even sixty and seventy bushels per acre. The seed is large, plump, white, and so well ripened by the high temperature, that it may be stored in bulk for months without danger of sweating or injury, and in fact often requires moistening before it is ground.

The quality of the California wheat is world-wide renowned for its weight, strength and whiteness. Some of the districts, such as Alameda, Santa Clara and San Mateo, produce the finest wheat in the world; and the quality of the whole State averages better than that of the States this side of the Nevadas. As there is no rain in the summer, the grain crops are left standing in the fields for weeks after they are ripe. Much of the grain is harvested by a machine called the header, which passes through the field cutting a swath fifteen feet wide, taking off the heads eight inches long, throwing them into a wagon by its side at the rate of an acre in less than an hour. The crops are generally threshed by a steam machine brought into the field. This machine requires two horses, two men and two horse-forks to feed it, and, we were told, threshed 800 to 1,000 bushels of wheat and put in bags per day. These bags remain in the open field piled up in rows until taken away by teams to the railroad stations. We saw acres of bags piled up five bags high awaiting shipment. On many of the large farms the ploughing is done by gang-ploughs, six abreast, and drawn by ten or twelve horses. A sower is attached to the plough, and in this way nine or ten acres of grain may be put in the ground in a day. And have you ever thought, my friends, of the importance of labor-saving machines as applied to the arts of husbandry. Without the modern inventions the crops of our country could not be harvested, its prosperity would be paralyzed and a partial famine would soon ensue. How wonderful the improvements in our own day! Some of us remember the old wooden plough of our boyhood. Compare this with the modern iron plough suited to all soils and situations, and still more marvellous, the steam plough, moving like a thing of life across the broad prairie, turning up its numerous furrows at once, and leaving behind it a broad wake like that of a majestic ship! Compare the old scythe and sickle of our fathers, slowly and tediously gathering up their crops, with our mowing and reaping machines, cutting down their ten to twenty acres per day! Aye, or go with me to those vast western valleys, look down that broad expanse, see those two hundred reaping machines, followed by a thousand men, women and children, binding up the golden sheaves at the rate of two hundred acres per hour. Look at these improvements, and I think you will agree with me that we live in an age of remarkable invention and progress. Nothing surprises the traveller more than the immense fields of wheat seen on the sides of the railroad. Think of riding for hours through fields of wheat whose breadth extends miles beyond your vision, and you will have some idea of the golden harvest of those ocean-like plateaus of grain that abound in California.

The supply of culinary vegetables, as seen in the markets of San Francisco and other cities, is very abundant and of excellent quality. What surprises visitors from the East is to find such articles as celery in the market all summer. When we arrived, on the 20th of June, celery, cauliflowers, melons and marrow squashes of famous size were on the stands in the market.

With irrigation, crop after crop can be obtained in varied succession, so that you may find anything you desire at any season. The early vegetables begin to come in during the month of February. Asparagus is cut from February to June. One grower informed us he had six acres. The product was about five tons to the acre, and was contracted for at nine cents per pound. The size to which vegetables attain is almost incredible. We were told of pumpkins weighing 250 pounds; squashes, 150 pounds; beets, 100 pounds; and carrots, 30 pounds. Astonishing as these facts may seem, it is easy to understand how such results are obtained where growth never ceases. The mean temperature of the coldest month, December, at San Francisco is said to be fifty-five degrees; in the interior it is probably lower.

Although our attention was mainly given to the orchard, vineyard and garden, our numerous journeys through the interior of the State afforded us opportunities of learning its agricultural character. We were everywhere impressed with the immense extent of the fields and farms, and flocks of cattle and sheep. One gentleman in Sacramento informed us that his farm embraced 13,000 acres of land, and that last year he sold $40,000 worth of wheat. We visited one dairy farm, containing 3,500 acres, with 600 cows, only an hour by rail from San Francisco on the San Jose railroad; and were told of another farmer who had 2,300 head of milch cows. In one of the small, very rich valleys, celebrated for stock raising, we were informed by a friend of ours, that in favorable seasons 20,000 to 30,000 cattle might be seen on the plains, and often so thick that they could not be counted. We met in our travels flocks of sheep on their way to the mountains, of 3,000 to 5,000 head, for fresh pasture. One firm from Maine, who crossed the mountains in 1852 with 2,000 sheep, now shear over 100,000, and own 150,000 acres of land. Another farmer, who went from Roxbury in this State, with whom we were formerly acquainted, now owns 32,000 acres of land and has 7,000 sheep. His neighbor owns an island devoted to sheep husbandry and has 115,000 sheep. This island is green with verdure throughout the year, and it is said that in Los Angelos County one may travel on the road for twenty-seven miles through the farms and islands of one proprietor. While lands in the interior of most excellent quality are to be obtained from five to twenty dollars per acre, those near the market are held at prices far beyond the means of immigrants or persons of less capital.

With the valley lands so wonderfully rich and productive, with a climate so mild and invigorating that cattle may lie in open field under mid-day sun, and neither animals or men suffer from heat, agriculture has progressed rapidly, as has also the ability to wield such immense farms with profit. It is but little over twenty years since the discovery of gold in California, and not until some years after was any considerable degree of attention given to agriculture. At first the want of experience in that peculiar soil and climate retarded its progress, and it is safe to say that the last ten or twelve years have produced the results we now witness. The value of these agricultural products in 1869 is stated to be $30,000,000. This, considering the population of the State,—less than 600,000,—is very great. Indeed, the growth and commerce of the cities of California, and the increase of agricultural and manufacturing productions and of mines, in a period of twenty years, is amazing. The variety of crops which may be grown in this State is wonderful. The foreign grape yields more abundantly than in any part of Europe. The fig, orange, almond, mulberry, pomegranate and the olive come to perfection. Silk culture promises to be successful, and large companies are formed for its promotion, and orders are already received from China and Japan for the cocoons on account of their excellence. The culture of the tea plant has been commenced and is likely to succeed, and in the Sacramento valley canals are projected for the culture of rice.

When we consider that it is only about twenty years since gold was discovered in California and that she has now a population of nearly 600,000 souls ; that she has a territory 800 miles in length and 200 in breadth,—twenty times as large as Massachusetts, three times as large as all of the New England States, four times as large as the State of New York or Pennsylvania ; that she has millions of acres of land equally well suited to tillage as any under cultivation—a soil richer in fertility than the banks of the Nile, a climate whose very breath infuses health, energy and enterprise, we can hardly estimate her future progress, prosperity and power. And now that the great highway of nations has been opened across our continent, now that the tide of population is pouring in on our western shores, a population which is strongly influenced by New England blood and New England principles, we begin to realize the great future of the Pacific slope. In view of the addition of this wonderful territory to our union of States, we are tempted to claim the fulfilment of the sentiment of Bishop Berkeley,—

"Westward the course of Empire takes its way,
The first four acts already past;
The fifth shall end the drama with the day,—
Time's noblest offering is the last."

Next to the cereals of California, no other production of the soil, wool perhaps excepted, is so important as the grape. The State has about 30,000,000 vines, two-thirds of which are in full bearing. The amount of wine made annually is probably about 4,000,000 gallons; that of brandy about 300,000 gallons. This is exclusive of the large quantities of grapes used for the table. Many of the vineyards are quite profitable, yielding from $50 to $500 per acre. Some of the varieties, such as the flame Tokay, have occasionally produced 8,000 to 10,000 pounds per acre. Nearly all the vines are foreign varieties, among which strongly predominate the Mission, as it is called, the Muscat of Alexandria, the Black Hamburg and Rose of Peru, the latter probably being the St. Peters of our collections. The cheapest grapes are the Mission, but they have often paid from fifty to one hundred dollars per acre. The grapes sold for eating bring from four to ten cents per pound; but three-quarters or more of the crop is sold to the wine manufacturer at about twenty dollars per ton. All the foreign kinds are grown, of which there are at present some two hundred varieties on trial.

California has great advantages for wine growing. The vines produce very abundantly, and much more to the acre than in our western vineyards or in those of Europe. The yield is constant and regular in California, without the risks of frost or damage from rain. Lands suitable for vineyards can be had in the interior and on the foot hills for a few dollars per acre. The vine is being planted on these foot-hills far up into the mountains, and both the fruit and wine are considered of finer flavor than that raised on the bottom lands. The vines are grown in tree form, without stake or trellis. The stems, from two to three feet in height,—some of the oldest ten to fifteen years planted,—are fully six inches in diameter. No summer pruning is practised further than the removal of superfluous shoots, early in the season. The bearing canes are allowed to run their full length, spreading over the ground, which is kept clear and well cultivated. They are planted eight feet apart. The cost of cultivating is $25 per acre, but some put it higher than this. The average product is about twelve pounds per vine through the State. The Mission grape is most productive, and frequently yields thirty or forty pounds to a vine; the Reisling not over four or five pounds. Some of the vineyards are 300 to 500 acres in extent. One of the most elegant vineyards that we visited had a grape arbor three-quarters of a mile in length, thirty feet in width and twelve feet high, covered with grapes trained in the most elaborate and artistic manner. Part of this grand arbor is used as a drive, in which carriages pass each other in freedom. California seems to be the home of the vine.

We do not intend to discuss here the expediency of crushing the ripe clusters for "the sweet poison of misused wine," but it is an established fact that no region whatever has superior advantages for producing wine. With a temperature higher and drier than that of Spain, or the most favored portions of Europe, with suitable lands almost fabulous in extent, where grapes are produced at a lower cost than anywhere else on the globe, where in some sections of the State wines can be stored in open sheds, instead of costly cellars, without injury, it may safely be stated that California is destined ultimately to become one of the greatest grape growing and wine producing territories of the earth.

I suppose it may be expected that I should express an opinion in regard to the culture of fruits in California. In the several sections we visited, and many others, fruit in general can be produced at a much less cost than with us at the East. 1st, In most cases the land can be had of good quality at low prices. Good fruit and grain land in the coast valleys, except close to a town or village, can be bought for $20 to $100 per acre. In the second range of valleys, Sacramento, San Joaquin, and others at a distance from market, at a much less price. 2d, The trees grow nearly twice as rapidly as with us, and come into bearing in less than half the time. 3d, The fruit is sure, large and handsome, and yet nearly exempt from diseases and insects. 4th, The atmosphere is so dry during the whole season that rotting on the trees is unknown; and the fruits remain on the trees sound long after they are ripe, thus greatly prolonging the season of gathering. 5th, The ground requires much less cultivation than at the East. When the dry season commences weeds cease to be troublesome, and for a period of between four and five months very little labor is needed to keep the ground in order, which is an important saving. And lastly, labor is quite as cheap as with us. The necessity for good culture exists there no less than with us, and is probably greater, as we observed instances where a single year's neglect had nearly ruined the plantation, owing to the exhausting nature of a climate where heat and drought are so prolonged.

As I have remarked, fruits and fruit trees are, in a great measure, free from insects and diseases in California; however, the few which exist, it is reasonable to suppose, will increase with the extension of fruit culture, the same as in other countries grown old. We saw a few caterpillars on the apple, slug on the pear and cherry foliage, aphis on the orange and olive trees, and mildew on the grape, cracking of the pear and curling of the peach leaf; but in all these instances only in a slight degree.

At the time we arrived in San Francisco, on the 20th of June, we found an abundant supply of all the early fruits. Of strawberries the first crop had passed, the second just coming in; apricots, early sorts abundant and beautiful; cherries in their prime, large, beautiful and excellent; currants plentiful and very large; early pears, chiefly Doyenne d'Ete and Madeleine; apples, mostly Red Astrachan; figs, gooseberries and early plums. We took immediate steps to ascertain in what localities we would find the best examples in the several departments of culture and within easy reach of us; and ascertained that the valleys of Santa Clara, Napa, Sonoma, Sacramento and San Joaquin contained some of the largest and best-conducted orchards and vineyards in the State. In the valley of Santa Clara we visited a large orchard which consisted of 3,000 pear trees, 4,000 apple trees, 35 acres of strawberries, 10 acres of grapes,—in all 73 acres. Grapes were planted among the pears, the orchard having been planted in 1855. The pear orchard was composed of many of the leading well-known sorts; the trees remarkable for health, vigor of growth and productiveness. The oldest were about twelve years, and some of these we estimated at thirty feet in height, and a foot in diameter of trunk at the ground. The crop we regarded as too heavy for the future welfare of the trees, and we suggested the thinning of the fruit; but the owner said the low price of fruit would not justify the expense. We shall speak of prices hereafter. Doyenne d'Ete and Madeleine pears were being picked, and compared favorably with those grown at the East; all other varieties seemed to do well; many were already, though not half grown, highly colored. The apple orchard was less promising than the pear, we thought, owing to the ground being too wet at a certain period of the year. Newtown Pippin was said to be the most profitable, and next to that, Smith's Cider, White Pearmain and Wine Sop.

The strawberry here, when irrigated, bears the whole year; but the principal crops commence in April, and continue into September. The strawberries are grown in rows three and a half feet apart by one and a half feet in the row, and kept in hills. The plants were six years old, the hills fully eighteen inches across, and were bearing ripe and green fruit and blossoms at the same time.

This gentleman has three artesian wells on his premises, varying in depth from 320 to 340 feet, giving a constant flow of water during the dry season. The strawberries are irrigated by carrying the water along the headlands in wooden flumes about eighteen inches square; stoppers are inserted opposite the spaces between the rows, and then the water is distributed and shut off at pleasure. The proprietor informed us that he had on his grounds a mile and a half of these flumes. The Longworth's Prolific strawberry here and elsewhere yielded more profit, and constituted the bulk of this fruit at the market stalls and in the shops. The later cherries were in perfection, and for size and beauty surpassed any we have ever beheld in any country. The Black Tartarian and Napoleon Bigarreau, sold under the name of Royal Ann, are much cultivated.

On the 28th of June we visited the plantation of another gentleman at San Lorenzo, who has 125 acres in fruits, planted fifteen years since, and was one of the earliest, most experienced and successful fruit growers in that country. We found him in his extensive and well-arranged fruit-packing house, preparing apricots, cherries, early plums, pears and currants for market. All were remarkably fine. He had sent that morning to San Francisco, cherries that measured three and three-fourths inches in circumference, and counted thirty-six to the pound. He sends annually about 65,000 pounds of cherries at from ten to forty cents per pound, though some of the earliest had brought seventy-five cents per pound. All are sold in San Francisco, the Black Tartarian always securing the highest price. He has forty acres of cherry currants; the bushes were covered with masses of fruit of enormous size. He has sold 140,000 pounds in one year at from nine to eleven cents per pound. The currants are trained in bush form on single stems, and the branches are carefully shortened during the growing season, to keep them compact and prevent breaking down. Of blackberries he has eight or ten acres, all Lawton. Generally this berry does not succeed as well as at the East, though we saw exceptions, to which we will refer hereafter. Pears are packed in fifty-pound and apples in sixty-pound boxes. Pears thrive here grandly; and he has raised the Pound or Uvedale's St. Germain, weighing four pounds three ounces.

Almonds are grown to great size, in lines of half a mile, both in the tree and fruit. We saw one tree fourteen years old, fifteen inches in diameter, that has yielded three bushels, which were sold at twenty-eight cents per pound. He has 2,000 trees on his grounds. The English walnut succeeds as well, and some of the trees are already large enough to bear two bushels of nuts each.

The sugar beet in this luxuriant soil attains to fully twice the size and weight it does with us in one season. We heard of single ones weighing 118 pounds. A company has been organized here for manufacturing beet sugar; and this same establishment proposes to unite the manufacture, on their own grounds, of currant jelly, which is so extensively put up in San Francisco.

In Napa valley we examined an orchard containing 100 acres: Here we saw a fine apple orchard, one of the best in that vicinity. The Early Harvest and Red Astrachan were fit to gather. William's Favorite was largely planted, and looked remarkably well. The following sorts were named as the most profitable, in addition to those we have mentioned. Early Strawberry, Summer Rose, Early Harvest, Wine Sop, Rawles Janet, Newtown Pippin, White Pearmain, Roxbury Russet, Rhode Island Greening, Yellow Bellflower and Smith's Cider. The Northern Spy and Baldwin failed, and had been grafted over with Yellow Bellflower and other sorts; the Newtown Pippin bearing off the palm as the best.

We visited another of the pioneers in fruit culture in Napa valley. When he commenced he planted peach stones, and in eighteen months gathered fruit from the trees, and sold many thousand bushels in San Francisco, and some at enormous prices. Cherries also flourished here, the Duke predominant. His sales of fruit one year amounted to fifteen thousand dollars.

Another orchard lies in the heart of this beautiful valley, of 140 acres of fruit trees and vines, all in the finest state of cultivation; the only defect being that the trees stand too closely together. They were of twelve years' planting; many were eighteen inches to two feet in diameter of trunk, and twenty-five to thirty feet in height. Of the 125 acres, 25 are in grapes, 50 in apples, and the balance in pears, cherries, &c. The apple succeeded here; the varieties were Early Harvest, Red Astrachan, Fall Pippin, Fallawater, Yellow Bellflower, Smith's Cider and White Winter Pearmain. The view of this orchard, as we rode through a lawn seeming more like an English park in extent, was grand and imposing; the whole estate with its grain fields comprising 2,300 acres.

One of the finest pear orchards at Sacramento contained 10,000 trees. The oldest trees had been planted nine years, and some of them were twenty-five or thirty feet high. Like others, the trees were crowded in planting. Here we saw the Beurre Clairgeau and Winter Nelis pear, after only four years planted, twenty feet high and stems full six inches in diameter, heavily laden with fruit. The following varieties were very fine: Beurre Giffard, Rostiezer, Bartlett, Winter Nelis, Duchesse d'Angouleme, Vicar of Winkfield and Seckel. Of the last-named the orchard contained 1,000 trees: of Winter Nelis a long avenue. This gentleman sent to the New York market in 1869 800 bushels of the Vicar of Winkfield pear; and the last year he sent to the East more than 6,000 bushels of pears, of which

500 bushels were Lawrence. And here in a grove of fig-trees, as large as apple-trees and twenty-five feet high, we partook of figs, apricots, peaches, plums, pears, blackberries, melons and grapes at the same time. Of the grape, he had one vineyard containing 10,000 vines, all of the Muscat of Alexandria, and of these he sent last autumn to Chicago five tons or more. Another fruit grower, in Petaluma County, we were informed, raises 60,000 bushels or 20,000 barrels of apples a year, and at Christmas time sends 300 to 500 bushels a day to market.

.On the 5th of July we visited the Alhambra gardens, in the Alhambra valley, near Martinez. The ranch embraces some 700 acres, ninety of which are planted with fruit; thirty-four acres are covered with grape, half with the Mission grape, so called; the other sorts embrace White Muscat of Alexandria, Flame Tokay, White Chasselas, Black Hamburg, White Corinth, Palestine, &c. Bunches of the last-named we found, on measurement, to be eighteen inches in length, though of course the berries were not half grown. Isabella and Catawba have been tested and found unsuccessful. The orchard contained 1,200 apple-trees, 1,000 pear-trees, 1,800 peach-trees, besides plums, cherries, almonds, apricots, figs, walnuts, pomegranates, quinces and oranges. The quince-trees surprised us; they were grown with one stem, like an apple-tree, and were the finest and largest we ever saw. The pomegranates, 180 in number, were superb plants, about six feet in height, covered with fruit and flowers. A splendid sight of the kind, and such a one as we never enjoyed before. They ripen in September and October, and sell for eight to fifteen cents per pound. In good seasons they produce 600 pounds. The Alhambra valley is narrow, wholly occupied by this plantation, and sheltered on two sides by hills some 600 feet high. The climate is therefore very warm, and on the first of July the mercury rose to 109 in the shade. The cottage of this gentleman was surrounded with groves of orange, fig and pomegranate trees; and here we dined most sumptuously, everything upon the table being furnished from his own grounds.

The next orchard which claimed our attention was a short distance from Sacramento, owned by the Messrs. Smith, who formerly carried on an extensive nursery business in addition to fruit-growing, and their grounds were regarded, and justly so, the finest in the State; but the floods so destructive around the city swept away a large portion of the grounds near the river, and covered other parts from three to five feet deep in sand. The finest portions were thus destroyed, and the wreck is still to be seen; the portion remaining bears a heavy crop. Pears and plums were especially fine; of the former, Dearborn's Seedling, Bartlett, White Doyenne, Winter Nelis, Easter Beurre, Dix, and Glout Morceau were prominent. Dearborn's seedling and Glout Morceau surpassed in size, beauty and quantity any crops we have seen. Trees of Dearborn were bearing eight to ten bushels of fruit; the Dix were high colored and fine; the White Doyenne was in its ancient beauty and excellence. The crops of plums were so heavy as to break down the branches of the trees; the early Orleans were just gathered and ready for market. Washington plums were superb. The ground where these fine, fruitful trees were growing was covered by sand to the depth of two to three feet, washed on by the flood; in our climate trees would have perished.

The apple, pear, peach, plum, and cherry all thrive and bear abundantly in California. The apples are larger than in the Atlantic States; those grown near the sea do not keep so well, and are not so juicy. Those grown in Sierra Nevada, where the winters are cool, keep as well as in New England. There are no worms in fruits; the curculio is unknown.

Until last year the production has exceeded home demand. This seems extraordinary when twenty years have not elapsed since the planting of the first orchard. We were told that in 1853 peaches were first sent to market, some selling as high as $6 per dozen, and even $5 for a single peach; now fruits are so plenty they are selling at 50 cents to $1 per bushel, and even at a lower price. In 1854 and 1855 cherries were brought from Oregon and sold for $2.50 per pound. A single apple was sold for $5, and 300 boxes of apples brought $1.50 per pound; peaches raised in Sacramento in 1855 and 1856, a single basket containing sixty peaches realized $60. Until last year the consumption was confined to the home market. But now the Pacific and other railroads open new markets, and greatly augment the demand. The business is now becoming systematized, and cars are being specially constructed to carry fruit to Eastern markets. We examined four of them just being finished at Sacramento, and two of them loaded with Bartlett pears, ten tons each, came over with us on our train, July 28, bound East. We brought some Bartletts home, which remained in good condition three weeks on the way from the time of picking.

Fruits keep without rotting much longer on the trees and vines in California than with us. The fig is produced in great abundance and of excellent quality in many parts of the country; indeed, we saw it fruiting heavily along the roadside on trees only five years old. In Putah Creek, one of the earliest and warmest locations, the fig comes to great perfection. The trees of one grove, only sixteen years old, are twenty-five feet high by forty or fifty broad, and they now cover the ground. Here the fig bears three crops in a year. One grove of four acres produced nine tons of dried figs, and were sold at $200 per ton, or ten cents per pound, and this was the second crop, the first having yielded equally large. When the process of drying becomes well understood, as it will shortly, the fig culture must become a source of great profit, and will, I think, rank among the most profitable fruits. At present much of the crop is lost every year. In a country where fruits can be grown so cheaply, modes of profitable consumption will soon suggest themselves.

For drying fruit, California is superior to most other countries in the world. As a general rule, the fruits are superior to ours in size and beauty, generally sweeter, but not superior in flavor. With a few exceptions, the cherries, apricots, as well as the early pears, are as fine as any raised in any country. The deficiency in flavor, if this exists, may be owing to the unripe condition of the fruit by premature picking and improper ripening. The early fruits, not of overgrown size, are usually of better quality, and not so fibrous and mealy as those of autumn. But we are unable to say how far the want of flavor is owing to improper treatment. In the case of strawberries, the best varieties have not yet been adopted by the market growers, and with the exception of the currant, none of the small fruits are as good as ours. The grapes are almost exclusively what we call foreign varieties. Wild native grapes abound in all the wooded parts of the State, but they are very different in character from our grapes of the East. American grapes have been tested, but, as far as we could ascertain, with unfavorable results; this, however, we do not regard as conclusive, as some experiments may yet be successful.

The ornamental trees and plants of California are unlike those which adorn our streets and gardens, and we were at once struck with their singular appearance. Instead of the elms, maples and chestnuts, which prevail at the East, we saw the Cape of Good Hope, Mexican and some other semi-tropical trees and plants. These are everywhere planted as common, and they grow as easily as willows do with us. So rapid is their development that we saw an Australian Eucalyptus tree which was fifty feet in height, five feet in circumference of trunk, and only six years old; and a Pinus Insignis six years old, forty feet high. We also saw fuchsias (ladies' ear-drop) ten feet high, with heads of four to six feet broad; beds of scarlet geranium of immense size and ten feet high, and in many instances trained to reach the second story windows of the house; in one garden, a fuchsia hedge of eight feet in height with stems as large as a man's arm; such tender trees and plants as we grow under glass are here found in open ground for ornament.

The collector of the port of San Francisco, Mr. Phelps, very kindly invited us to visit the forts, islands and other objects of interest in the harbor. On this delightful excursion we were honored with the company of His Excellency Governor Haight and a large party of military and naval gentlemen, with their ladies and a full band of music. At Black Point, General Ord's quarters, there was a glowing mass of scarlet geraniums, full ten feet high, noticeable far out in the bay; tree mallows and fuchsias of enormous size. But what especially interested our party was the fact of partaking of refreshments from the very table on which the late General Robert E. Lee signed the surrender of the Southern army. At Fort Alcatraz we saw a trellis of ivy-leaved geranium six feet high; a mass of flowers forming a division fence; heliotropes and fuchsias, seeming more like trees than green-house plants. At Angel Island we noticed a hedge of rose geranium fifty feet long and nine feet in height; and this same plant grown as standards, with clean stems and large heads, at least five feet high and four broad. Angel Island is a charming place, and if angels were ever to seek a residence on earth, no spot is more suitable than Angel Island. I know not what flowers were grown in Eden, but of this I feel sure, that none had more stately growth, gorgeous hues or exquisite fragrance; and I confess it gave me great pleasure to learn that this delightful spot was a place of favorite resort, and that these beautiful flowers—trained by the fair hands and nourished by the sweet smiles of a daughter of Massachusetts—were not

> ——— "born to blush unseen,
> And waste their fragrance on the desert air."

Rose-trees were everywhere to be seen in the gardens, some of which were six to eight feet high, with stems as large as the arm,—even our delicate tea and noisette roses attain an extraordinary size. We rode through a beautiful avenue one mile in length, bordered with live oak and rose trees planted alternately. Green-house plants, such as are seen in our windows for house-plants, here in the open air reach eight to ten feet in height.

We were everywhere astonished at the rapidity with which trees and plants grow in California. We saw the common garden fennel ten feet high, the lemon verbena ten to twelve feet, the oleander twenty feet, and the fig, one year old, six feet. The camphor, allspice, guava and other tropical trees succeed as well as in our hot-houses. We saw a Mexican pine which had made a shoot of thirteen feet in one season; a hedge of prickly pear six feet high and four feet broad: and grapes in fruit the first year from the cutting. We saw noisette roses and scarlet geraniums trained to the top of a three story house, covering the whole end; a tree mallow twelve feet high, with stem ten inches in diameter; and an Australian pea, trained on a water tower, forty-five feet high, covering it entirely.

But what surprised us most was the ease with which such trees and plants as the palms, the American aloe or century-plant came to maturity. At one of the fashionable watering-places we found lodgings provided for us in the cottages, each having palm-trees before its windows; and it was a common occurrence to find in the gardens the century-plant, which seldom blooms with us short of fifty or sixty years, in full flower at the age of ten or twelve years. We saw several from thirty to forty feet in height, and with stems one foot thick at the base.

Ornamental trees in California are larger and far more beautiful than with us. We saw a sycamore or buttonwood tree 115 feet high; a California laurel fifty feet high with trunk ten feet in diameter. On our way from San Jose to San Lorenzo, on the Western Pacific Railroad, waiting for a train, and seeing in the midst of a grain-field a large horse-chestnut tree, we thought we would give it a closer examination. The tree exceeded our expectations both in size and beauty. It was fully fifty feet high, with a spread of branches forty feet by measurement. The branches swept the ground on every side, and were then, June 28, in full bloom. The flower spikes were from twelve to eighteen inches in length, many two feet, all in a drooping or pendulous position. After that time we met with thousands of this species in different parts of the State, but no specimen approaches this either in size or beauty. Our party decided to have this tree propagated; and in commemoration of our visit named it "Esculus Wilderi."

Under this tree we found a party of Chinamen, who had been employed in binding grain, preparing their dinner. We were received kindly, and at once invited to partake of their humble meal. "Want some soup?" "Yes," was the reply. This was served in a bowl with chop-sticks, and we were delighted at our success in using them. "Want some cake?" "Want some tea?" "Yes," and after partaking of these, we offered them money, but they disdained filthy lucre, and we parted much pleased with these Orientals. Boston is well known to the Chinese, and they call the white men "Bostons." And here allow me to remark, that we feel no alarm on account of their immigration to this country. The introduction of the Chinese is in accordance with the designs of Providence. It is this that has brought them to our shores, and we might as well expect to retard the motion of the heavenly bodies, as to arrest this progress of civilization. We give it, therefore, a hearty welcome, as one of the means of developing our vast national resources, and as the best means of ultimately Christianizing a great heathen nation. Already they are attending our schools, acquiring our language, adopting our customs, and some are filling places of trust in financial, commercial and other business. We had intercourse with many of these men, and found them favorably inclined to our country and its institutions. We attended a Sabbath school of two or three hundred of the Chinese, from the ages of ten to forty years, and on this occasion there were present seventeen Chinese merchants, several of whom addressed the school, all in favor of its objects. Nor would we omit the fact, that one of the chief tellers in the Bank of California is Mr. Lee Kan, a gentleman of polished manners, and around whom we saw four of his countrymen counting the precious metals. We say then to the Chinese, as we have said to the people of other nations, come if you choose, and sit under the genial shade of our tree of liberty. Come if you choose; we will educate, elevate and energize you with American principles and American enterprise, and as long as the heavens above shall continue to reflect the wisdom, goodness and mercy of an Almighty hand, so long let this blessed land of freedom, of schools and of churches, be the home and refuge of the oppressed and down-trodden, from whatever source they may come.

Among the wonders of California, we must not fail to notice the Geysers, or the famous hot springs. These are situated about 125 miles north of San Francisco. We take rail to Calistoga, a celebrated watering place, where we find on arrival that our good friends, always anticipating our comfort, had provided quarters for us in cottages on the lawn, each having palm-trees in front. Here, too, we found arrangements had been made with Mr. Clark Foss, the celebrated knight of the whip, to take us over the mountains. The next morning, with open wagon and four in hand, he whirls up to the door. "All on board" is the word. "All right" is the response, and off the horses gallop at the rate of twelve miles per hour. Soon we approach the mountain and commence creeping up its sides, over a road scarcely wider than our carriage, resembling a spiral staircase in its frequent curvations, and reach the summit station. Here the horses are exchanged, the company refreshed, and on we wind down the hill for thousands of feet, into the valley below. We soon arrive at the hotel, where we find that the thermometer marks 107 degrees in the shade of the piazza. We are now at the Geysers, which are located in the canyon opposite, but the weather being hot, we feared to enter it until the next day. At five the next morning, we start on our excursion to the dreadful Geysers. We wander down the vale to the foot of the canyon, where we cross a beautiful little river, whose cool, translucent stream, placid as Lethe, winds around the base, regardless of the dark, sulphurous waters which gurgle and gush up all along its banks. But on we creep up the dismal ravine, and soon we come to the Devil's Pulpit, and the Devil's Arm-chair, both of which we rejoiced to find vacant. And now I beg the indulgence of the audience, and especially of my reverend friends, for any seeming impropriety of language in describing this awful yawning gulf. And now we are in the throat of the sulphurous canyon, where vegetation dies, and only abominable things live, where the very air oppresses you above, and where thousands of boiling springs, around and beneath you, are muttering, sputtering, bubbling and belching, like the long pent-up fires of a volcano. Imagine, if you can, a combination of the fumes of sulphur, soda, nitric acid, phosphorus, borax, alum, ammonia and every other detestable ingredient, and you may have some idea of the atmosphere of the Geysers. And here the ground beneath you is covered with an incrustation of sulphur, magnesia and other chemicals, like the yellow lava from an overflowing crater. Now your feet are burning, and your guide cautions you not to step from the trodden path, lest you might find yourself sinking you know not where.

On either side, and near your path as you travel up, are numerous large boiling springs,—the Devil's Inkstand, from which we took a bottle of ink, and with which these words are written; the Devil's Tea-kettle, always boiling and ready to scald you or your tea, in which you might cook an egg in two minutes: but the most noted is the Witches' Cauldron, an immense cistern six feet wide, casting up scalding, spouting, turbulent waters from a fathomless abyss. And here I confess that it required but a little imagination to fancy that Pluto had established a grand *entrepôt* underneath, and Lucifer himself was stirring up the fires at the bottom, wherever that bottom might be,—and with a still further range of thought to imagine that Hecate and her weird sisters were dancing around this infernal cauldron and chanting their malefic incantation of,—

"Double, double, toil and trouble,
Fire burn and cauldron bubble
For a charm of powerful trouble,
Like a hell-broth boil and bubble."

I could stand this no longer. I must escape to the mountain-top or die in this most unchristian place; and having been brought up in the good old faith to fear sulphurous flames or something worse as a punishment for evil deeds, and with the steamboat hissing and wheezing above me, the earth oozing with boiling waters beneath me, the air loaded with unearthly fumes, liable by the contact of soda and acid to throw me aloft or by brimstone and fire to send me below, I hastened to escape from these Plutonic regions, and once more to revisit the earth and breathe the pure air of heaven.

Having done the Geysers, we take our carriages for recrossing the mountains. We climb up as before and reach the last station. Here we take a fresh relay of horses, the drivers regale themselves with mountain dew, some of our company quaff the crystal rill. some imbibe the ambrosia of the vine. In a few moments we are all on board and all right. And now comes the world-renowned feat of our modern Jehu. Crack goes the whip. "Sharp!" says Foss; and soon the noble steeds are on the run. Round and round and round, hugging close to the mountain side, we go, and down, down, down, like a boulder from the mountain-top, we dash thousands of feet into the valley below. "Time! time!" say the passengers. Four miles in twenty-two minutes, says the redoubtable Foss. Soon we are on the level road, all thanking a merciful Providence for the preservation of our lives, and resolving never to take that risk again.

We did not visit the Yo-Semite Valley, that wonder of the world, for we remembered that sage advice that discretion was the better part of valor, and so we reserved our visit until the journey should become less dangerous.

But some one inquires, "Did you see the big trees?" Oh, yes; there they stood in sublime majesty, towering above all around them; rearing their lofty heads midway between heaven and earth, their topmost branches fading from our vision in the blue ether above. "But are these trees so old and grand as have been represented?" Yes; time with unerring finger has inscribed in concentric circles on their venerable trunks a history far back of the age when Jesus of Nazareth walked on earth. How marvellous their story! A thousand years before our Saviour was born some of these trees had their birth.

Nearly nineteen centuries have since passed away, and still they live on. The Egyptian pyramids are wearing away, sand by sand; monuments are crumbling into dust; the ancient cedars of Lebanon are fast passing away; but the gigantic *Sequoia*, in unconscious sovereignty, fit type of the magic growth of American civilization and power, still lives on; and *who* shall say that it may not continue for thousands of years to wave its branches in ever-living green, and, like the free institutions of our beloved land, wave on to the final day!

The trees we visited were in Calaveras County, 190 miles north of San Francisco, where we also found many large trees of the Conifera species. Words would fail to describe the sensations in riding through this giant forest, on a road as smooth as a park drive, just as the sun went down on our approach to the grove. As we entered the grove the moon had risen so as to throw a silvery light on the two "big trees," Sequoia, which form a grand gate-way over 300 feet in height, and called the Sentinels. As we passed between them we were filled with amazement, and uncovered our heads in reverence to those glorious monarchs of the forest. Our heart was too full for utterance, but our inmost soul cried out, Speak to us, ye children of olden time; oh, speak! Tell us in what age you were born; tell us who inhabited this mighty forest when you first came forth from earth. Tell us what tempests, earthquakes and revolutions you have witnessed in your day and generation! But the tears in our eyes spoke louder than the noble trees, and so we passed on to the hotel. Soon after our arrival I stepped out into what I supposed was a small garden plot surrounded with trees. Looking up, I could but just see the sky above their tops. It was like looking through nature's telescope reaching from earth to heaven. I called my friends and said, "Do you see that tall tree? Do you see the star above it? It is not a yard from the top of the tree to the star!" But, my friends, these were not the BIG TREES!

In the morning, after breakfast, we started on our journey through the grove which is in close proximity, indeed surrounding our hotel. The grove is said to extend over fifty acres, but the largest specimens are grouped in a comparatively small space. We have alluded to the "Sentinels," which form a gateway, as it were, to the grove. The largest of these is 315 feet in height, the others over 300 feet, and twenty-three feet in diameter. There are nearly 100 of these trees in the grove, ten of which are thirty feet or over, in diameter, and upwards of 300 feet in height. Many of these trees have tablets nailed to them, looking much like country guide-boards, inscribed with the names of persons and places. Some are decidedly inappropriate. We do not object to the illustrious names of George Washington, Daniel Webster or Abraham Lincoln, Drs. Lindley, Gray or Torrey, William C. Bryant, Henry Wadsworth Longfellow or Henry Ward Beecher, the Empire, Granite, or Bay State, the Father of the Forest, the Mother of the Forest, the three Graces; but names like Salem Witch, Siamese Twins, Old Bachelor or Old Maid, are simply desecrations of the noblest works of God's creation. As these trees have all been described so often by travellers, it would be superfluous for us to give a detailed account of them; but I will name a few of the largest.

In 1853, one of the largest trees, 92 feet in circumference and over 300 feet high, was cut down. Five men worked twenty-five days in felling it, using large augers. But the monarch was so accustomed to standing, he would not then come down, and it required three days more work with wedges, to make him bow his stately head. The stump of this tree has been smoothed off, and a house built on it which has accommodated three cotillion sets. Our party of sixteen persons assembled on its headless trunk, and there, in commemoration of our visit, we joined hands and sang "Auld Lang Syne." With united congratulations and benedictions, we parted with this relic of former ages, declaring that it was the most substantial and the greatest stump orator we ever saw. The Mother of the Forest is 327 feet high, and 78 feet in circumference without the bark; this was nearly two feet thick, and was sent to the World's Fair in London in 1851. The tree is dead, but a young pine is growing in its top. One of the largest trees, the Father of the Forest, long since bowed his head in the dust, and yet how stupendous even in his ruin! He measures 112 feet in circumference at the base, and can be traced 300 feet, where the trunk was broken by falling against another tree; it here measures 16 feet in diameter, the size of the section of the big tree on exhibition in the city of Boston, and according to the average taper of the other trees, this venerable giant must have been 450 feet in height when standing, and forty feet in diameter. A hollow chamber or burnt cavity extends through the trunk 200 feet, large enough for a person to ride through on horseback, and whose upper side is wide enough for a carriage to run on. Walking upon the trunk and looking from its uprooted base, the mind can scarcely conceive its prodigious dimensions, while on the other hand tower its giant sons and daughters, forming the most impressive scene in the forest.

But who will believe our report? What traveller did not doubt their size until, with measure in hand, he had spanned these giants of the forest? Imagine, if you can, a tree whose height is 100 feet more than that of Bunker Hill Monument, and, even more marvellous if possible, of one whose height was more than double that of Bunker Hill Monument, and whose first branch was 200 feet from the ground, and you would have a correct idea of some of the largest of the big trees of Calaveras County. There are also groves of these trees in other parts of California, where specimens of even larger size, it is said, have been seen. In Fresno County a tree was recently taken down, whose limbs, exclusive of the trunk, made more than 100 cords of wood, and another into whose hollow trunk two men have ridden abreast on horseback.

And who that has ever stood amidst these miracles of creation can fail to render reverential awe to Him who made and has preserved them to this time! How appropriate the sublime words of our own poet, Bryant:—

"Father, thy hand
Hath reared these venerable columns; thou
Didst weave this verdant roof. Thou didst look down
Upon the naked earth, and forthwith rose
All these fair ranks of trees. They in thy sun
Budded, and shook their green leaves in the breeze,
And shot toward heaven. The century-living crow,
Whose birth was in their tops, grew old and died
Among their branches, till at last they stood,
As now they stand, massy and tall and dark,
Fit shrine for humble worshipper to hold
Communion with his Maker."

CONCLUSION.

Our tour was one of continued interest and unalloyed gratification, and, did time permit, it would be pleasant to allude more particularly to our journey across the continent,—to those heaven-piercing mountains of which Nevada has a hundred, each from ten to fifteen thousand feet above the level of the sea—to the fearful passes, and almost fathomless canyons beneath, some of which are hundreds of feet below the level of the sea—to the forty miles of snow-sheds, twenty-five feet high, so strongly built and roofed, and to those almost interminable stretches of desolate plains over which we travelled. Even these impressed us with a sense of sublimity and surprise, suggesting the thought that although now so apparently barren, they might be made fertile, and become the abodes of civilization. Some of these give unmistakable evidence of fertility, and we were glad to perceive that the good work of planting trees had in some instances been commenced on the line of the Pacific Railroad.

A vast amount of these lands, it is believed, may be made to produce good timber, which will serve to shelter the crops, improve the climate, add charms to the scenery, give comfort to the traveller, and induce immigrants to locate, where, without these evidences of fertility, a state of desolation would exist for ages to come.

And now, I would express our entire satisfaction with the excellent construction and arrangement of the great *trans-continental* Pacific Railroad. In common with the people of our whole country, we say, honor and gratitude to the noble men who conceived, executed and brought to a triumphant completion this most wonderful work of modern times,—a work which will ever be memorable in the annals of history for its bold enterprise, rapid construction and grand achievement.

Nor can I close these remarks without reference to the courtesies and hospitalities extended to us by the good people of California. The first of these was the reception at Omaha of a telegram from the California committee, with the inquiry, "When will you meet us at sunrise on the summit?" To which we responded, "At sunrise Monday morning;" and just as the sun was lighting up his fires on the snow-capped mountains around us, the delegation, consisting of the presidents of several societies with their ladies, met us, each bearing bouquets of flowers and baskets of fruit; and from that time until we parted with them at the same place thirty days later, an occasion made memorable by a joyous dinner and a brisk game of snowball, we were treated with a degree of affection and regard that will ever be remembered with heartfelt gratitude. Never shall I forget the sensations of that hour when we stood on Nevada's summit to receive the congratulations of our friends, some of whom we had not seen for more than twenty years; and when standing amidst those snow-clad cliffs, sparkling in auroral light with sapphire and gold, I thought I was never so near heaven before,—I could almost imagine that I saw the glittering spires of the New Jerusalem above, and in a moment of exaltation I exclaimed, in the language of the old Latin poet, "*Sic itur ad astra*"—*this is the way to the stars.*

Some present may think that I have too highly appreciated the resources and importance of California in comparison with the blessings and privileges of our own New England. We are often charged with extolling her merit; but while we acknowledge the rising greatness of our Western States, empires though they may be, still we would be just to ourselves, cherishing with undying affection the homes of our fathers, from whence have gone forth so many of those benign influences which have made our country what it is. How has she encouraged and fostered every effort for the spread of the gospel—for the diffusion of knowledge—for the extension of human freedom—for the support of constitutional authority—for the progress of internal improvements and the development of national resources! How has she sent her sons as pioneers to colonize by her enterprise, to utilize by her industry, to enrich by her wealth, and to build up by her example, new States for the diffusion of the piety, patriotism and principles of her fathers! and so, in the future, wherever their feet shall be planted, however dense the forest, however distant the shore, there her churches, school-houses and benevolent institutions shall rise, the blessed harbingers of future good. But whatever rank may be assigned by Providence to New England in the future, her name will forever be cherished by grateful millions for the good she has already done.

Whenever I reflect on what New England has done for the world, what she has done for the cause of education, religion, civil polity, and for the amelioration of the ills that flesh is heir to, the blood courses more freely in my veins, and my heart rises in gratitude to the Giver of all good that he permitted me here to be born—

> "Here let me live, here let me die!
> And a small stone tell where I lie!"

Mr. Lewis of Framingham. I would like to make one remark before we close. I want to say to the younger members of this audience and to the citizens of Framingham, that Col. Wilder is the head and front of our Board of Agriculture. It is to his credit that this Board originated with him, and it is largely to his labors that we are indebted for the existence of the Agricultural College. He is a Boston merchant, who has spent many years of a long life in doing what some of our farmers turn up their noses at,—practising *book farming*. He is an old gentleman now, and probably we shall never hear him again in this hall, though I hope we may, and before we part I wish to offer him our sincere thanks for his able lecture; and to those gentlemen who have, through these three days, given us so much valuable information, I desire also to tender our hearty thanks. I hope that every person, young and old, in this hall will not forget the gentleman who, in an eloquent address that I once heard him deliver, said, "When I am gone, plant a tree over my grave." He has done more for agriculture and for fruits than any other man in the country. You can hardly be aware how much we are indebted to this one man. I was on the Board for six years, and an abler, harder-working man was not to be found there. I give him the credit for it. I hope we shall pass this vote of thanks, as a slight tribute to these gentlemen.

Mr. Esty, of Framingham. I am very happy to second the motion. Allow me a word further. It was my pleasant duty three days ago, in behalf of the citizens of Framingham, to address a few words of welcome to the members of the Board of Agriculture, and I then promised that we would do all in our power to make this visit pleasant to you. I hope we have redeemed that promise. We on our part have received great pleasure from these meetings, and I believe we have all been profited by them. The discussions and addresses have been such as to make a permanent impression, from which we shall derive benefit in the future. I doubt not that we all take an interest in everything that will benefit the material interests of the country, but I am sure we would not exchange this small, but glorious old State in which we live, notwithstanding its cold climate and the hardness of its soil, for that great State on the Pacific, with its strange and almost fabulous resources of which we have heard this evening.

I again say, sir, in behalf of the citizens of Framingham, that we are glad you came here, we are sorry that you leave us, and hope that you will come back again. It is with regret that we bid you farewell.

Col. WILDER. I cannot allow the moments to pass without recognizing the words that were uttered by Mr. Lewis, with whom it has been my privilege, as a member of this Board of Agriculture, to labor in this field. I thank him for the expression which he has given, as your representative, of his feelings. I can only say, that I hope to live for years and to work with you ; but if that tree should ever be planted over my head, I hope it will bear better fruit than I have borne.

The CHAIRMAN. As the temporary organ of the Board, I feel it my duty, and something more than my duty, my most sincere pleasure, to say something in response to all the kind expressions which have been uttered this evening on the part of the citizens of Framingham.

The Board thank you, ladies and gentlemen, they thank you from the bottom of their hearts, for the kindness with which they have been received. And we feel and we express these thanks, ladies and gentlemen, not alone for ourselves, but because we think it indicates upon your part, and upon the part of this neighborhood, some interest in the agricultural prosperity of this Commonwealth, and some interest in an appreciation of our labors in its behalf. We are merely a board of citizens of the Commonwealth, acting officially, and prompted to our action by no salary and by no responsibilities excepting those which we feel that we bear in common with the other citizens of the Commonwealth. We believe that as this State grows old, as the West overpowers and overshadows us, politically and otherwise, that as the State grows more and more like the old countries, the interests of agriculture become more and more important to it.

We believe that the modes of agriculture must change with the times, and that the people of this State, if they would preserve their independence as a people, their morality as men and women, the purity of their children, they must rely, next to our high and holy religion, upon an agricultural population, rooted and grounded in her soil. We are here, ladies and gentlemen, to help that interest. We are here doing what we can to interest the farmers of the State in their own occupation. We ask them, for their own interests and the interests, of their children, to encourage all that may seem to them, after due consideration, to be of advantage to the interests of agriculture. For that reason, in the course of our annual perambulations, we have come among you ; and although we do not say anything in disparagement of the hospitality with which we have been received in other places,—at Concord, at Amherst, at Greenfield, at Pittsfield, last year,—we only say, that nowhere have we seen so much general interest manifested and so much hospitality exhibited as have met us here. We cannot, therefore, but thank you. I believe that our duties here are ended, and I am sure that if we could, consistently with our duties, vote to see you again next year, we would gladly do so. (Loud applause.)

The Board then adjourned, *sine die.*

ANNUAL MEETING OF THE BOARD.

The Board met at the office of the Secretary in Boston, on Monday, January 30, 1871, at twelve o'clock, Hon. Marshall P. Wilder in the chair.

Present—Messrs. Baker, Bassett, Birnie, I. K. Brown, Clark, Clement, Davis, Durfee, Ellsworth, Fearing, Goodman, Hubbard, Hyde, Johnson, Knowlton, Loring, Moore, Morton, Peck, Saltonstall, Slade, Stone, Ward and Wilder.

Messrs. Loring, Goodman and Clark were appointed a committee on the order of business.

This committee subsequently submitted the following

REPORT:

1st. Reports of Delegates.

2d. Reports of Committees on the subjects assigned to them.

3d. Report of the Committee on the Agricultural College.

4th. Miscellaneous Business.

5th. Appointment of Delegates.

The Committee would recommend that the committees on the selection of subjects and to consider the arrangements of the annual country meeting be appointed at an early stage of the session. (Signed) GEO. B. LORING, *Chairman.*

The reports of delegates to the various agricultural societies were then submitted as follows:—

Mr. Slade reported upon the Middlesex South; Mr. Goodman, upon the Essex; Mr. Stone, upon the Worcester West; Mr. Hyde, upon the Worcester South; Mr. Clarke, upon the Worcester North; Mr. Fearing, upon the Middlesex; Mr. Brown, upon the Worcester; Mr. Peck, upon the Worcester South-East; Mr. Clement, upon the Hampden East; Mr. Ward, upon the Franklin; Mr. Knowlton, upon the Berkshire; Mr. Hyde, upon the Marshfield; and Mr. Morton, upon the Nantucket.

A committee to suggest a list of subjects for investigation and essays, was constituted by the appointment of Messrs. Loring, Clark and Hyde.

A committee of three to consider and report upon the time and place of holding the country meeting was constituted by the appointment of Messrs. Davis, Birnie and Goodman.

Voted, That the returns made in reply to questions concerning the condition of the various agricultural societies, be referred to the Secretary and the committee appointed to prepare the questions.

President CLARK submitted the following essay upon

NATURE'S MODE OF DISTRIBUTING PLANTS.

The wonderful adaptation of living beings to every portion of the earth's surface must impress even the most casual observer. The red snow of the glaciers, the phosphorescent fungus of gloomy caves, the drifting lichens of the Siberian steppes, the brilliant flowers of Alpine summits, the gigantic sea-weeds of the Antarctic Ocean, the gorgeous air-plants of the tropics, the venerable cedars of Lebanon, the immense sequoias of California, the towering gum-trees of Australia and the glorious palms of the Amazon valley, are but familiar examples of the infinite variety of vegetable life. These diverse forms are, however, limited in their distribution by the peculiarities of soil and climate as well as by their specific characteristics. While some thrive only on rocky cliffs, deriving their sustenance from the atmosphere, others require the rich vegetable mould of the prairies or the fertile alluvion of the rivers. Some delight in dry, sandy localities with abundance of light and heat, while others are never found except in dark, dank forests. Many aquatic plants grow in the cold, fresh water of mountain swamps, and others amid the sulphurous vapors of hot springs or the brackish waters of salt marshes and the sea. The succulent cactus withstands the parching heat of the desert, while the almost equally fleshy orchid sends out its aerial roots only in a climate loaded with moisture. The most luxuriant vegetation exists in equatorial regions, near the level of the sea, where heat, light and moisture are most abundant and most constant. The boundless forests of Brazil exhibit the greatest number of species, and probably the most enormous plant-growth per acre to be seen anywhere, though possibly equalled in the latter respect by the evergreen timber of the Sierra Nevada, which often attains an average height of two hundred and fifty feet. As we recede from the equator toward the north or south, we notice a gradual change in the appearance of plants, dependent principally upon the mean annual temperature, but often peculiarly modified by those geographical features which affect the time, manner and quantity of the rain-fall.

Elevation above the sea level also produces the same result upon the development of plants as a change in latitude. Lofty mountains within the tropics furnish examples of vegetation precisely analogous to that of the whole earth, their summits often being crowned with the very species whose blossoms greet the traveller in the brief summer of the polar regions.

The surface of the earth has been divided by botanists into eight zones, marked by certain isothermal lines, and characterized by the predominance of certain vegetable forms. Each of these zones is represented, also, in the vegetation of mountains near the equator, which rise above the snow line; and these zones of altitude are designated by the names of their peculiar species of plants. Thus, the equatorial zone is called the region of palms and bananas; the tropical zone, the region of tree ferns and figs; the sub-tropical zone, the region of laurels and myrtles; the warmer temperate zone, the region of broad-leaved evergreen trees; the cooler temperate zone, the region of deciduous trees; the sub-arctic zone, the region of conifers; the arctic zone, the region of alpine shrubs, and the polar zone, the region of alpine herbs.

Massachusetts lies within the cooler temperate zone, which is bounded on the north by the isotherm of 41° Fahrenheit, and on the south by that of 54.5°. The average mean annual temperature at Amherst, for the last thirty years, is 46.37°. This is the region characterized by extensive forests of deciduous trees in great variety, often intermingled with needle-leaved evergreens. The plains when fertile are covered with rich pasture grasses, and when barren with heather and other low shrubs, while the swamps produce sedges and mosses, and contain frequently deposits of peat. The climate is very intense, and characterized by sudden and decided changes. The winters are long and severe, with a mean temperature below 32° and not unfrequently a depression of the thermometer to zero, and even to 20° below. The ground is often bare during one-third of the winter, and is consequently frozen to the depth of from one to four feet. Since the trees are mostly stripped of foliage and all herbaceous plants killed by the frost, the winter landscape presents a peculiarly dreary aspect, especially in the absence of snow. This extreme severity of the cold season is a great hindrance to the introduction of numerous desirable trees and shrubs, to the growth of which the summer is well adapted. The mean temperature of the three warm months is from 65° to 70°, and there are often five months without frost. The annual fall of rain and snow averages about 45 inches of water, and the distribution of it through the year is tolerably uniform, though droughts are not uncommon and occasionally injurious.

Those plants which endure the peculiarities of the climate without special care or protection are said to be hardy. It is somewhat remarkable that science has thus far sought in vain for any satisfactory explanation of the peculiar sensitiveness of many species of plants to cold. The wood of the tender orange tree is as close-grained and as hard as that of our evergreen kalmias or rhododendrons, with similar leaves, and protected from severe frost will ripen its fruit and most of its young growth every summer. The succulent prickly pear survives the alternate freezing and thawing to which it is exposed on the sands of Nantucket, while the guiacum, which produces the solid lignum vitæ, succumbs to the slightest frost. In like manner the tuberous roots of the dahlia are killed by frost while those of the peony are uninjured. The cormus and foliage of the delicately beautiful crocus seem utterly indifferent to the effects of cold, while those of the elegant ixia, belonging to the same family, are exceedingly sensitive—a difference of habit which the keenest botanist would fail to discover, except by actual trial. The relations of living plants to drought and moisture are equally remarkable and inexplicable. Thus most seeds and many bulbs will retain their vitality unimpaired for years in a dry atmosphere, while others, like the seeds of the magnolias and the nympheas and the scaly bulbs of the lilies, germinate with great difficulty after desiccation.

In the study of the vegetable kingdom we find some species of a truly cosmopolitan character, and existing in a wild state in all quarters of the globe. The common brake, pteris aquilina, is a striking instance of this sort, being abundant in various parts of the five grand divisions of the earth and on many islands of the ocean. This is doubtless owing to its vigor of constitution and the minuteness of its spores, which are borne to great distances by the winds. About thirty species of flowering plants are common to both the arctic and antarctic regions and are also found upon numerous intervening mountain summits. Whether they are the remnants of an ancient flora which once covered the whole earth, and which has been largely superseded by species of more recent origin, or whether they were created in many widely separated localities simultaneously, are questions which we have not the data to answer.

The area over which any particular wild species is distributed is usually definitely limited, and the centre of greatest abundance from which it seems to have spread is well marked. Under similar climatic influences in different countries, we do not generally discover the same identical species, but in most cases such as are closely allied. Thus the violets of Europe are not repeated in America; but we have an abundance of similar species. The heaths of Europe are represented by different species in Africa, and by a different but strikingly similar family in Australia. There are no pine-trees south of the equator, but an abundance of peculiar firs, with all the characteristics of the cone-bearing family. Many species are of a social nature, and occupy the ground to the exclusion of others less vigorous, and these, like the Canada thistle, often become, when worthless, exceedingly troublesome and injurious. Such are the shrubs and coarse herbs which annoy the inhabitants of the Tartarian steppes, and which encumber the soil, prevent the growth of grasses, and are useful only for fuel. In like manner, artichokes and peach-trees are said to overrun immense tracts of the pampas in the Argentine Republic and the Patagonia, having been introduced from Europe and supplanted the native vegetation by virtue of their superior vigor. In the same way many of our most common weeds have been imported from other regions, and have become naturalized so thoroughly that their extermination is well-nigh impossible. The conflict with evil, however, should never be remitted, notwithstanding all difficulties and discouragements. It is said that over large districts in the great plain of China, the most productive country in the world, all the native wild plants have been destroyed, and only those are seen which are cultivated. It is hardly to be desired that Massachusetts should be so thoroughly cultivated as to destroy all the beauties of her natural vegetation; but it would be delightful to have some power capable of delivering those who faithfully practise clean culture on their own premises from the weeds and worms propagated upon the lands of their slovenly neighbors, or of the public.

There are two principal methods observed in nature, and imitated by man, for the distribution of plants. These at first seem quite dissimilar, but upon closer examination are evidently alike in principle, and differ only in the degree of completeness to which the natural process of reproduction is carried. Buds and seeds are the essential means for the propagation of all the forms of vegetation, and, therefore, especially worthy of careful study with regard to their origin, nature and use.

The simplest form of plant, such as the palmella nivalis, which constitutes the red snow of arctic regions, consists of a single cell with its contents. This is seen upon examination under the microscope to resemble precisely an ordinary hen's egg. The outer covering or shell forms a spherical cavity, and consists of a colorless membrane of cellulose. This is lined in the young and living cell by a membrane like that within the shell of an egg, which is called the primordial utricle, or the original sac. Within this is inclosed the nitrogenous vital fluid or protoplasm, corresponding to the white of an egg, in which floats the nucleus, a minute globular body, analogous to the yolk. Vegetable growth results from the multiplication and enlargement of these cells; and the macrocystis pysifera, a sea-weed, which in the Antarctic Ocean sometimes attains a length of seven hundred feet, may be regarded as merely an aggregation of simple cells, and limited in size only by the capacity of its stem to resist the force of the waves. In the higher orders of plants these spherical cells are variously modified and arranged to accomplish certain important objects. Thus to form the outer bark, as in the canoe birch, they are compressed and flattened; to build up the stout woody fibre, as in the hickory, they are elongated, and the tapering extremities lapped upon each other; to constitute the ducts for the circulation of air through the plant they are joined into continuous tubes; while solidity is imparted to the heart wood of trees and the stones of fruits by the thickening of the cell walls.

The multiplication of cells arises in some cases from the development of new cells within the fluid contents of unicellular plants, which are thereby destroyed, but at the same time reproduced and multiplied. Ordinary plant-growth, however, results from the spontaneous subdivision of living cells on or near the surface, and the subsequent enlargement of their subdivisions to the full size of the original mature cell. This process of vegetation, by which living plants continue to increase in bulk, is, therefore, simply the reproduction of cells by cells. In this way the roots which supply food, the branches which serve to expand the foliage to the vitalizing influences of the sun and the atmosphere, and the leaves, which are the organs of digestion and respiration, are perfectly developed in the relative and absolute proportions of the species to which the individual may belong. This miracle of growth, where all the organs are present and all the circumstances favorable, is utterly beyond our comprehension and must command the admiration of every contemplative person. But the facts relating to the reproduction of plants and the preservation of species and varieties are still more wonderful. Not only have active cells the power of multiplication in the several parts of a vegetable, but every cell seems to be endowed with the capacity of reproducing the entire individual. Thus from the fragment of a root, the eye of a tuber, the scale of a bulb, the cutting of a stem, or a bit of leaf we can readily produce, first a tender growing point or bud, and from this a complete and perfect plant with all the peculiarities of the parent, even to the color of the flower and the flavor of the fruit.

While this capacity to reproduce the entire individual under certain circumstances may be regarded as belonging to every living vegetable cell during its most active condition, provision has been made for the development of peculiar cells, or clusters of cells, abundantly endowed with vitality and variously protected, which are designed to facilitate the growth and propagation of every plant. The most common forms of these are the ordinary leaf buds produced in the axils of all true leaves ; the seeds of flowering plants ; and the buds and spores of various kinds of the cryptogamia. These bodies, therefore, constitute the special means by which Nature distributes plants. Buds are generally designed only to grow upon the parent stock, or in its immediate vicinity, and are usually destroyed by desiccation. They have the same structure and chemical composition with ordinary cellular tissue, and, though occasionally used as food by men and animals, can scarcely be considered as subserving any secondary purpose in the economy of wild or uncultivated life.

Man, however, has learned to use buds in many ways for the propagation of plants by extension, and, as most of the valuable varieties of flowers and fruits in cultivation can only be reproduced by this method, buds are objects of peculiar interest to the horticulturist. In multiplying plants by grafting or budding, the object is to transplant perfected buds from the cambium layer of one stock to that of another. If this be so done that the sap of the stock flows freely into the transplanted bud, and the bud be prevented from withering by the exclusion of the air, the operation presents little difficulty in the case of plants belonging to the same species and possessing a similar structure and habit of growth. Where the species is the same in the bud and the stock, the advantage to be gained is the production of some desired variety of flower, fruit or foliage, which has resulted from the modification of the original or wild plant by cultivation or accident. Thus all the beautiful purple beeches are said to have been reproduced from one tree in Germany, which was an accidental variety, and many of our choicest fruits and flowers have been originated by hybridization and other artificial means.

In a few instances, different species have been united in this way, but the size and vigor of the mismated product is very decidedly affected, and, except for particular, and for the most part temporary objects, such unions are undesirable. The most valuable results have thus far been attained by grafting the pear upon the quince, a tree upon a shrub belonging to a different genus. The dwarf trees thus produced come into bearing very early, and with high culture yield for a limited period large crops of fruit, which in some cases is of finer quality than that borne by standards of the same variety. When grafted upon the mountain ash, a small tree of the same genus, the pear is said to ripen its fruit earlier than under other circumstances. It has also been grown with less success upon the apple, the hawthorn and the medlar. The peach and apricot may be grafted upon the plum, and thereby become, perhaps, somewhat more hardy in our climate in consequence of the check thus imposed upon their tendency to grow and fruit excessively while young. It is also said that in England the plum stock causes an earlier development of the buds in the spring from its superior hardiness, and so lengthens the season, which at the best lacks the heat requisite for the highest ripening of the peach.

Some varieties of pear refuse to unite with a quince stock, and are propagated as dwarfs by double grafting, that is, by grafting them upon other dwarf varieties, which are growing freely upon the quince.

In the production of new varieties of apples and pears from seedlings, the young shoots may be brought to bearing very soon by grafting them upon a mature tree; and, when a valuable variety is secured, it may be multiplied with surprising rapidity by the process of budding young stocks.

Whether the character of the fruit of the stock has any effect upon the fruit of the graft is very doubtful, although gardeners often prefer to ennoble, as they say, a fruit by grafting it upon another of excellent quality. Experiments of this kind have not yielded decided and convincing results, though the custom at present is to employ vigorous seedlings as stocks without regard to their origin.

The influence of the scion upon the stock is more probable theoretically than that of the stock upon the scion, since the elaboration of sap occurs in the leaves, from which it must be distributed downward. Recent experiments with the variegated abutilon have demonstrated that the foliage of the stock becomes variegated while the scion is growing upon it, and when the latter is removed from the plant, the variegation of the foliage disappears. Nevertheless, it is hardly to be expected that any important results will be attained in this direction, in respect to the modification of flowers and fruits, though experiments are desirable. It is well known that some varieties have a remarkable inclination to sport, producing differently colored flowers upon different branches. This may result from a mixing of qualities by hybridization, or possibly grafting, upon the supposition that a portion of a cell of the scion has united with a portion of a cell of the stock to form a sort of mechanically crossed cell, which has reproduced itself with infinite variations. But neither hypothesis accounts for the well-known fact that this tendency to sport is very rare in comparison with the whole number of hybrid and grafted plants.

Tomatoes, potatoes, cucumbers and even grasses have been successfully grafted, but the process is generally confined to hard-wooded plants with exogenous stems. Soft-stemmed and endogenous plants are usually grown from cuttings, which, in a moist atmosphere with bottom-heat, root without difficulty. In this way tens of thousands of potato plants have been started during the past few years.

Many wild plants, especially among the lower orders of the vegetable kingdom, are reproduced by buds which either develop in connection with the parent plant, or separate from it and establish themselves in the soil. Occasionally buds assume the form of bulblets in the axils of leaves, as in the tiger-lily, or on the flower-stalk, as in the top-onion. These fall to the ground, sometimes before and sometimes after sprouting, and thus reproduce their kind. Among the numerous methods in which

Nature distributes plants by buds may be mentioned the following, viz.: By suckers from widely spread roots, as in the locust; by runners, as in the strawberry; by subterranean stems, as in the witch-grass and bind-weed; by natural layers, as in the gooseberry; and by the rooting of the tips of canes or fronds, as in the raspberry and walking fern; finally, a few species of plants, like the rose of Jericho in Palestine, the resurrection plant of California, and the edible lichen of the Siberian steppes, become detached from the soil, and are distributed in all directions by the winds, during certain seasons of the year, when vegetation is checked by drought or cold. When heat and moisture return, and circumstances favor, these wanderers take root again and renew their vegetative life.

From the preceding statement it appears that buds, however useful in cultivation for the multiplication and diffusion of plants, are but imperfectly adapted for the preservation of species under unfavorable influences, or for their distribution over any wide extent of country. To accomplish these objects with greater certainty, and also to provide for men and animals more various, delicious and especially more nutritious articles of vegetable food, Nature produces fruits containing seeds and spores. The proper limits of this essay will admit only a very general account of the structure and functions of the organs of vegetable reproduction, and the modifications to which they may be subjected by the intelligent efforts of man, but perhaps even this may not be without interest and value.

When seed-bearing plants reach a certain degree of size and maturity, a peculiar kind of bud appears, in addition to the ordinary leaf buds, which develops into a flower instead of a leafy branch. In regard to size, at the period of first flowering, plants vary from one-quarter of an inch in height to two hundred feet; and in respect to age from the seed, they vary from a few weeks to a hundred years or more. Some species, like the grape, begin to blossom very young and continue to do so for a long period, while others, like the talipot palm, grow for many years, and then produce an enormous number of flowers and seeds, and die exhausted. That the flower bud is only a transformed leaf bud is evident from many curious results of cultivation, such as the growth of green leaves in the centre of a flower, or upon a fruit, or the conversion of the entire blossom into leaves, as in the green rose. This is a reason also for the fact that plants often fail to blossom in consequence of too much vegetative vigor, which may be overcome by root pruning, by confinement of the roots in a limited space, or by a scanty supply of water or food.

Though we are often inclined to accept as literal truth the words of the poet,—

> "Full many a flower is born to blush unseen,
> And waste its fragrance on the desert air,"—

yet, the beautiful colors, the peculiar odors and the honeyed sweetness with which they are endowed, by no means fail to accomplish a useful purpose. By these attractions countless insects are enticed to fly from plant to plant, and so to transport the fertilizing pollen which would otherwise rarely attain its proper destination. Without entering at all into doubtful questions of vegetable physiology, we may state that the production of seeds and spores capable of germination presupposes the impregnation of ovules or spore-cells by pollen grains or some corresponding bodies. While the great majority of flowers contain both sets of sexual organs, yet sometimes they are found upon separate plants. It is believed that in most cases, pollen is efficient in fertilizing the ovules of some other flower than the one by which it is produced—in other words, self-impregnation, if possible, is by no means common. Fertilization is, therefore, usually effected either through the agency of the wind, of insects or of man transporting the pollen from one flower or plant to another. The only species which has from time immemorial been thus artificially impregnated for the production of fruit is the date palm, which bears the stamens and pistils upon different trees. The caprification of the fig in the Levant, performed by hanging branches of the wild tree upon the cultivated at the time of flowering, is designed to effect the same object by the introduction of insects into the young fruit. It does not appear, however, to be of any special advantage, though long practised.

Artificial impregnation of ovules and spores, though unnecessary in ordinary cases to the development of fruit, has assumed in recent times great interest and importance from the fact that it affords the means of securing new and valuable varieties of plants by hybridization and cross-breeding. True hybrids or mules are produced when the ovules of one species are impregnated by the pollen of another, and seeds thus obtained which are capable of germination and complete development as plants. Cross-breeds result from the blending of mere varieties of plants of the same species, which occurs often by accident, as observed in the mixing of different varieties of Indian corn, when growing in the same neighborhood. While the production of hybrids is more or less difficult, even between closely allied species, and the seeds obtained often few in number and but feebly endowed with vitality, cross-breeds are produced with the greatest facility. Hence the constant tendency to deterioration and change in the varieties of garden vegetables, since it is impossible to raise pure seed of more than one variety of any species in the same vicinity, unless they blossom at different periods.

The difficulty of obtaining true hybrids is illustrated by the fact that only 259 were procured as the result of 10,000 experiments carried on during many years by Gaertner, the highest authority upon this subject. He found it impossible to form hybrids between many closely allied species, as between the currant and the gooseberry, the blackberry and the raspberry, and the pear and the apple. He also was unable to discover any definite law respecting the relative influence of the parent species, sometimes the characteristics of one and sometimes of the other being most predominant in the hybrid. The majority of hybrid plants have not the power to develop perfect seeds, but, like the mules of the animal kingdom, are sterile, and therefore can only be propagated by extension. Moreover, the seeds ripened by hybrids are usually formed in the earliest and most vigorous flowers which open, while the later flowers are barren ; and such seeds often germinate into plants, which may be called still-born, since they inevitably perish when the nourishment laid up in the seed is exhausted. In the few cases where hybrids produce perfect seeds freely for several generations, the plants revert in character to one or the other of the original species ; and, if a hybrid be crossed with one of its parent species, seeds are yielded in abundance which develop into plants with the characteristics of that parent.

The principal obstacle to be overcome in hybridizing species capable of crossing arises from the extraordinary power of the pollen of every plant to fertilize the ovules of the same species, even after apparent impregnation by pollen from another species. It is therefore necessary to remove with peculiar care the stamens of the flower to be impregnated before the anthers are fully developed, sometimes even before the petals expand. After the pollen has been applied to the stigma, several hours, or in some cases days, must elapse before the pollen tubes attain the requisite length to reach the ovules, and hence the stigmatic surface must be carefully protected from the pollen of its own species during all this period, and until the fruit is set.

The inestimable value to the world of this method of obtaining new varieties of fruits, flowers and esculent vegetables, would be amply demonstrated by an enumeration of some of the more important results attained by skilful horticulturists of Massachusetts, many of whom are now, or have been, members of this Board.

Such a list we propose to consider, and report to this Board at some future time.

A normal seed consists of a bud and a certain amount of exceedingly concentrated organic matter carefully enclosed within a double envelope, which is usually of a firm, close texture and admirably adapted to protect and preserve the living germ within. The nutritious matter which is designed to serve as food for the germinating plantlet may be in the form of a large bud simply, or it may be associated with a small bud in the form of one, two or more seed leaves or cotyledons, or a portion of it may be in the condition of packing around the bud as albumen. It exhibits a great variety, however, in its chemical character, though containing in most cases the same elements. Thus the milk and flesh of the cocoa-nut are very much unlike vegetable ivory, which forms the substance of the seed of another species of palm, and the oily butter-nut is quite different from the farinaceous grain of rice. These differences in the composition of seeds determine to a great extent their hardiness and ability to preserve their vitality under unfavorable circumstances. As a general rule, dry, hard, farinaceous seeds are least liable to destruction from long keeping, or from the effects of heat and moisture. So great is their power of resistance that many of them will lie in the ground one or more years without germinating. A seed of pandanus utilis brought from Cuba, and planted within thirty days from the time it was taken from the tree, remained without germinating eighteen months in the moist propagating pit at the Durfee Plant House. It was in a pot of damp loam, and kept most of the time at a temperature about 60° Fahrenheit, and finally produced five vigorous plants. Many species of seeds from Australia, especially those of the leguminosæ, will remain torpid for years in the ground, unless thoroughly scalded in hot water for a few minutes before planting. This inactivity is doubtless, in part, due to the fact that the seeds are so long out of ground after ripening as to become very dry and impervious to moisture, and in part to their peculiar farinaceous composition. The duration of vitality in seeds which are protected from moisture, after being thoroughly dried, is quite variable, though there would seem to be no reason why a seed which can retain its power to germinate for five years should not equally well do so for five hundred. Melon seeds have been known to grow when forty-one years old, beans when one hundred, and the seeds of the raspberry are believed by the best scientific authorities to have germinated seventeen hundred years after they were buried in the stomach of a man whose skeleton was exhumed from the depth of thirty feet below the surface of the earth near Dorchester, England. It is also generally believed that wheat at least three thousand years old, taken from a tomb in Egypt, has germinated and produced a useful variety of this valuable cereal, which is called mummy wheat. In some cases living seeds have been thrown up from deep excavations, where they appear to have lain undisturbed for many centuries. In these instances they have been below frost, and often somewhat protected from water by layers of clay and other peculiarities of the strata above or around them.

There are numerous circumstances which induce the popular belief that the soil is filled with seeds and spores in a dormant condition, although it must be admitted that there are no records of their actual discovery by observation. Whenever the right combination of influences occurs, countless numbers of plants of certain species spontaneously appear. Thus upon land recently cleared of timber and burnt over, fire weed and willow herb are almost sure to spring up in great profusion. A clearing in a forest of oak or chestnut, if left undisturbed, is usually soon covered with a dense growth of pines or spruces, even in cases where there would seem to be no opportunity for a recent seeding of the tract. In the town of Panton, Vermont, it is said that formerly cultivated lands, allowed to remain fallow, soon became furnished with a fine crop of hickory, although none was known to grow among the native forests within fifty miles. All such instances, however, require to be received with some allowance, as a portion of the truth is very likely to be concealed from the knowledge of the observer, upon whose testimony these extraordinary statements are made. It is quite as probable, to say the least, that one or more trees of hickory were hidden among the forests near the land from which the new crop sprang, and that the nuts were scattered by ground squirrels and mice, as that the living nuts could have lain unobserved and torpid during the cultivation of the fields, as well as for untold ages before. When we consider that a single tobacco plant produces fifty thousand seeds, a large elm-tree more than half a million, and a giant puff-ball thousands of millions of spores, enough in fact to stock the whole earth, and when we recollect how readily and widely they may be scattered by natural causes, we shall hesitate somewhat about believing that the soil is so full of ancient germs retaining their vitality as some would have us think.

Will not some zealous microscopist turn his attention to this interesting subject and search for seeds and spores in the soil and subsoil of our forests and meadows, and, having found them, endeavor to develop them into thriving plants? The facts are certainly sufficient to warrant a thorough investigation, though in all probability the cases of seeds thus buried and retaining their power of germination would prove to be altogether exceptional.

Spores are minute vesicles or cells consisting of a double envelope of cellulose filled with a vital fluid, and capable of germinating under favorable circumstances. Theoretically they seem rather detached cells than organized buds or seeds. A bud or seed always begins its growth at a particular well defined point, but the spore is alike on all sides, and pushes out its young radicle from the under part towards its supply of food. The tens of thousands of flowerless plants, such as ferns, mosses, algæ, fungi and lichens, produce spores and are propagated by them, just as flowering plants are by seeds. Spores of terrestrial cryptogams are so small and light as to be readily borne to distant regions by the winds, and the number produced by each plant is usually very great, so that wherever favoring influences exist the appropriate species are never long in making their appearance. The spores of algæ and other aquatic cryptogams are distributed by running streams, waves and oceanic currents.

The principal agent in the general distribution of the seed of phenogamous plants is the wind. To favor this operation provision has been made in a variety of ways. Thus the heaths, the grasses and the orchids generally have small and very numerous seeds, and, in common with many other families, have a dry fruit, which opens gradually and is shaken by the winds until the contents are widely scattered in various directions. Again, the needle-leaved trees generally produce winged seeds, which, as the scales of the ripening cones separate, are wafted away to considerable distances on the moving air. The small, dry, one-seeded fruits of the compositæ, like the dandelion and thistle, are often supplied with beautiful tufts of down or silky bristles, which bear them aloft and float them through the atmosphere like balloons.

The seeds of the cotton, the silk weeds, willow herbs and many others are furnished with similar means of conveyance, by which they are carried away from the ripening capsule.

The violent hurricanes of warm regions must prove very efficient in distributing seeds, even where they are not very well provided with special apparatus for aerial navigation.

Streams of fresh water and oceanic currents and the combined influence of wind and wave are most important aids in plant distribution. Not only are aquatic seeds and fruits thus widely disseminated, but the fruits of the cocoa-nut, the seychelle and other species of palm, the screw-pine and other large plants, are wafted from island to island in the waters of tropical oceans, while the floating masses of ice in the arctic regions often distribute the seeds of dwarf alpine species. Those currents of air or water, which move east or west, will of course be more useful in this work than those tending north or south, because the latter would more frequently transport seeds to uncongenial climes.

A few species of plants have been supplied with an apparatus for projecting the seeds and spores to some distance from the parent. Thus the fruit of the hura crepitans or monkey's dinner-bell tree explodes when ripe with a loud report, scattering the seeds far and wide. Every one is familiar with the peculiarities of the common touch-me-not and the squirting cucumber. Some of the fungi, as the puff-balls and the sporangia of many ferns, burst when ripe with considerable elastic force, and so spread their minute spores to considerable distances. Nevertheless, curious as these contrivances are, they are of comparatively little importance in the general work of plant distribution.

Finally, plants are scattered over extensive portions of the earth's surface by animals in a manner often apparently accidental; Nature having furnished many seeds and fruits with hooks and claws or with a viscid covering, by which they become attached to moving objects and are carried often far from their native habitats.

Familiar examples of plants thus furnished are the burdock, the clot-burr, the burr-marigold, and the bush trefoil. The herbivorous animals, like the buffalo, the antelopes, wild oxen and wild horses, which often range over a wide territory, are the most efficient accidental distributors of plants.

Birds also often disseminate the stones of small drupes and the hard seeds of berries which are unaffected by their digestive organs, and a few birds as well as many small quadrupeds have a habit of storing up acorns and other nuts and seeds, which not unfrequently are by this means brought into favorable localities for germination.

The influence of man in modifying Nature's mode of distributing plants is very great and constantly increasing. The destruction of forests, the draining of swamps, the introduction of new plants for cultivation over millions of acres, all tend to the eradication of existing wild species, and the substitution of a much smaller number of higher value. Of the hundred thousand species of flowering plants known to botanists, hardly one hundred are of much importance to agriculture, and probably not more than a thousand are of any consequence in horticulture for the production of either flowers, fruit or vegetables. The evident tendency of scientific culture is towards an increase of hybrids and cross-breeds, rather than to the elevation or acclimatization of new species. The apple, so attractive in Eden, still has its charms for us, and we are still trying with encouraging success for better varieties. The fig, so important there, has never been neglected nor lightly esteemed among men. The example of the first historical vine-dresser has been, if not always steadily, at least faithfully imitated by his numerous descendants. There can be little doubt that as a few domestic animals have been peculiarly adapted for the use of man, and are specially capable of development to meet his wants, so a very limited number of plants have been from the beginning designed to hold a prominent place among cultivated species, and will to the end of time continue to reward abundantly all intelligent efforts for their improvement.

W. S. Clark.
Marshall P. Wilder.
Nathan Durfee.

The essay, after an interesting discussion, was laid over under the rule, when the Board adjourned.

Second Day.

The Board met at ten o'clock, A. M., Mr. Hubbard, of Brimfield, in the chair.

Present: Messrs. Agassiz, Baker, Bassett, Birnie, Bradford, Boise, I. K. Brown, N. P. Brown, Bucklin, Clark, Clement, Converse, Ellsworth, Fearing, Goodman, Hubbard, Hyde, Johnson, Knowlton, Loring, Moore, Morton, Peck, Saltonstall, Slade, Stone, Ward and Wilder.

Mr. Bradford submitted a report, as delegate, upon the Worcester North-West Society; Mr. N. P. Brown upon the Middlesex North; Mr. Ellsworth upon the Norfolk; Mr. Bucklin upon the Bristol Central; Mr. Hubbard upon the Hingham; Mr. Boise upon the Martha's Vineyard, and Mr. Johnson upon the Hampshire, Franklin and Hampden.

Mr. Goodman submitted the Report of the Examining Committee of

THE MASSACHUSETTS AGRICULTURAL COLLEGE.

The undersigned, appointed by this Board, a Committee for the visitation and examination of the Agricultural College for the year 1870, report as follows:—

Two of the Committee, Messrs. Goodman and Stone, have visited the college at the end of each term, and have given close attention to the examinations, and have also examined in detail the results of the operations on the farm, and all other matters of importance connected with the institution, while Professor Agassiz, owing to sickness, has only visited Amherst incidentally during the summer. The examinations of the students in classes have been upon agriculture, horticulture, botany, physiology, chemistry, geology, mental and kindred sciences; and we have witnessed the military drills, and observed with gratification the topographical drawings by the students. Having had a previous knowledge of many of the young men, we are convinced that the system of instruction is well calculated for the ends in view, and that the students are making commendable progress in their studies, and that the several professors are not only accomplished in their respective departments, but earnest and thorough in the prosecution of their duties.

The leading object, of course, in this institution, in compliance with the Act of Congress to which it owes part of its endowment, is to teach such branches of learning as are related to agriculture, and to include military tactics; and it seems to us, that the course of study and instruction laid down is eminently in consonance with that object, and that the sciences taught are with pointed reference to the uses of the farm. The theory of scientific agriculture is thoroughly taught, and the application of such knowledge is made on the farm under the direction of the professor in that department, who is a practical farmer; and all students are compelled to work at the details of husbandry, so that manual labor becomes a valuable adjunct to mental application. Chemistry, botany, physiology and zoölogy are, of course, invaluable to the farmer in regard to the analysis of soils, the use of manures, the food of animals, the growth of grains and fruits, the anatomy and physiology of animals, and the conditions and habits of destructive insects; and mathematics and civil engineering, in the use of the chain, compass and level, are almost equally necessary. Specialties, such as logic, mental and moral philosophy, political economy, English literature and modern languages, must also to some extent be embraced within the curriculum of any educational institution of a high order. Without entering at all into the discussion as to the value of classical learning in an ordinary course of education, and without intending to cast a doubt upon the utility of such studies to develop the mind and heart, exalt the aspirations and improve the taste, it is enough to say that they are not absolutely necessary in agricultural colleges, and that during the period (none too long) in which the students are passing through the course as laid out, there is none too much time devoted to the more special studies appertaining to the direct object of the institution.

As the Act of Congress especially includes military tactics as a leading branch to be taught in all colleges receiving the bounty of the nation, and without expense to the State, and details an accomplished officer to instruct the classes in such tactics, it may appear supererogatory to say more upon the subject; but your Committee cannot refrain from alluding to the interest which all the young men take in the drills, the evident beneficial effect upon their bearing and health, and the value of the accomplished soldiers and officers thus made for the future service of the Commonwealth, in the event of another call to send forth her sons for herself or the nation. Were no other result accomplished by this institution, the money of the Commonwealth could be no more judiciously expended, and yet this instruction is but an incident to the regular course.

The two members of your Committee who have visited the college have, as before stated, given special attention to the farm, both on account of the criticisms current regarding it, and because to one of said Committee, at least, the farm is the major part of the premises. At our first visit last winter certain parts of the barn adjuncts were in admired disorder, owing to the violence of the gales in the fall and the inundation of the cellar. For the latter reason the manure could not be properly composted, nor were the cattle above so arranged and bedded as seemed right in the eyes of the more advanced farmers; but under the personal direction of the farm superintendent, who brings to his work not only muscle, but intelligence of a high order, the proper remedies were applied to these disorders, and, with the exception of a restoration of the cattle-sheds in the yard, to rebuild which there are no funds, everything about those premises is in good keeping, and the excellence of the crops, taken from the fields in which this imperfectly composted manure was mingled, attests a careful culture. And it must not be forgotten that this was the first season in which the whole force of the farm, especially the teams, could be applied to its development, the appropriations by the legislature of money to erect buildings having been always made at the beginning of the farming season. And your Committee in this connection desire to correct what they regard as a popular error, viz., that the college should possess a model farm, like a Dutch garden, complete and formal in every part. On the contrary, we think it should be a working farm, on which all experiments may be tried, and, if necessary, over and over again, that the students may take part in all kinds of agricultural labor; but, of course, a main object should be to grow profitable crops, and to plant, cultivate and harvest them in the best manner and condition. It is desirable, also, that more attention should be given to the garden, and the students be early taught the value of so important a part of the farm, and we trust that out of the first appropriations of money for the college, a sufficient sum may be applied to the erection of suitable forcing beds for the production of early vegetables, by which, not only can the pupils be instructed in one of the most profitable branches of agriculture, but no inconsiderable revenue could be derived from the sale of the products in the vicinity of the college.

The farm is now well stocked with cattle, a large proportion of which are thoroughbreds, and though purchased at reasonable rates fairly represent the various breeds. They are stabled and bedded comfortably, and the manure made by their means and the matter composted with it will enable such enriching to be given to the soil, that the farm products must necessarily, under proper cultivation, yield hereafter largely in excess of previous seasons. In addition, a valuable young stock will soon be growing up, and the cattle of the vicinity, and through it that of the State, will be continually improved by the use of the bulls, whose services are afforded at such reasonable rates as to give no excuse for the least prosperous farmer to degrade his stock by breeding to inferior ones. These pure-bred animals were put in competition with many others of the same class at one of the large exhibitions in the State the past fall, at which one of your Committee was present, and received a due share of admiration and premiums.

From what we could learn from the students who take their meals at the boarding-house we infer that they consider the board as good as can be afforded for the moderate price charged, and if we should suggest any alterations as to details it would be to reduce the amount of meat and add more largely vegetables and farinaceous food, and especially unbolted wheat bread, and, in lieu of pastry, substitute fruits of the season. But under the present system the person who hires the boarding-house, and is limited as to the price which he shall charge the students who board with him, cannot be expected to do more than give a fair equivalent for such price ; and probably as the products of the farm increase, the trustees who have the oversight of this matter and are not blind to its importance will contrive some plan by which the students may have a greater variety at the minimum price. But as long as the energetic president of the college has any old apple-trees on the farm to be cut down or any other active employment for the young men, there will not be much complaint from them about their food, if it is abundant and of good quality. It must not, however, be forgotten that the only mode of providing board for such students as are unable to pay but a small price is by some such regulations as are now enforced on the person keeping the house, and that it is optional with other students whether they board there or elsewhere.

We commend to the consideration of the trustees the suggestions of the Committee of last year as to the boarding-house being run under their direction, and have no doubt they will come to a conclusion in consonance with the best interests of the students and the college.

"No man," said Jefferson, "ever repented of having eaten too little." Students will hardly subscribe to this axiom ; but they do not desire, nor should they have, during their life at college, aught but plain, wholesome fare, similar to what they had at home. Upon a review of our examination of the college and the farm, we are satisfied that great improvements have been and are being made in all the departments, that the students are not only well taught the theory of the various sciences in the class-rooms, but are practically instructed in the laboratory, in the field, the garden and the drill-room. The future usefulness of the pupils in agriculture is also held up prominently to their eyes, and the kindred sciences taught are necessary adjuncts to its full development, and no more special attention is bestowed upon them than is necessary for such purpose.

It is too late to re-open the question as to the necessity of educating the farming community for its own sake as well as for the sake of all other classes. To the rural population we must look for the substratum of all society, and from it come not only those who provide the material means for the subsistence of all others, but from its ranks are recruited the greater proportion of the most reliable business and professional men, and useful and efficient women. This class of society should be able to furnish the best possible material in the future, as it has in the past, for the use of the State, but as its prosperity has not increased in the same proportion as that of others, it cannot care for itself, even as formerly, when the pinchings of parental economy, the savings of fraternal and sisterly affection, scarce sufficed to educate one member of the family; and now that education in other institutions has become so costly, farmers' sons can only be instructed in institutions adapted to their means and objects.

Whether or no special institutions can educate agriculturists, and whether the business of farming can be conducted scientifically, and to the profit of the farmer and the nation, are questions of the past. The hundreds of agricultural schools in Europe attest the avidity with which more thorough knowledge—of the natural laws which govern the growth of crops and the atmospheric changes, of the habits, anatomy and diseases of domestic animals, of the principles of mechanics applicable to farm implements and machinery, and of many other things, not possible to be learned without special instruction—is sought; and the result of such instruction has been shown by the greatly increased production of the soil in those countries which foster these institutions.

With the aid of a national grant, the State of Massachusetts has initiated an institution to promote the education of the most prominent and numerous industrial class in the Commonwealth, and so far as the experiment has progressed it is a success. It is not, however, complete, for the original scheme of providing buildings for four classes has not been perfected, and until that is done it cannot be said that the spirit of the original grant nor the intentions of the organizers of the institution have been carried out; and, if the experiment should by any possibility now fail, it would be owing, not to any lack of applications from the class whose instruction is had in view, nor from any want of energy or ability on the part of the trustees, presidents or teachers of the college, but solely from a want of accommodations for the tendered pupils. No educated and interested observer of this institution can fail to note that a four-years' course is barely sufficient to perfect the students in the necessary learning for the objects in view; and that, if sufficient accommodations are afforded, the college will be filled by large classes, while, as the number of pupils increases, the expenses of the institution will be met by a corresponding increase of resources.

We hope to see this institution put upon a complete and solid footing. At present, since it has no wealthy alumni to appeal to, and the people for whose sons its instruction is intended are, in the main, of very moderate means, its only reliance is, in the outset of its career, upon the beneficence of the whole community represented in the legislature, and we do not believe that community will desire that an experiment which has been so far successful shall now fail for need of that support which, if not expressly promised, was impliedly vouched for at its inception.

At the proper time, we trust a professorship of veterinary science will be added to the college, and the diseases and treatment of the horse and other domestic animals be so taught that we shall have a class of men among us qualified to treat the ills of those animals in a scientific and humane manner, and the present system of quackery and inhumanity be abolished.

LOUIS AGASSIZ.
RICHARD GOODMAN.
ELIPHALET STONE.

Mr. BRADFORD was appointed a committee on credentials of new members.

Mr. MOORE submitted the following essay upon

MARKET GARDENING.

Market gardening or the growing of vegetables, for the purpose of supplying the demand for such articles in our cities and large towns, is a subject worthy of our careful consideration, not only for the reason that vegetables contribute to the health of every one, but also for the great amount of palatable and cheap food they furnish to all our people. And knowing as we do that there is a constant decrease in the quantity of meats produced in all of the older States in our country, we are at once reminded that this loss in food for the million must be supplied by the increased consumption of vegetables. And the proposition that vegetables are conducive to health, and also one of the cheapest sources of food, appears to be so well settled as not to require an argument to prove it.

This business is a form of agriculture combined with horticulture, and to be carried on successfully must have, in addition to the original cost of the land, a considerable amount of capital invested in manure, glass and structures, either in the form of forcing houses or hot beds. And it requires more skill in the preparation of the soil, more skill in the selection and planting of the seed, more skill in adaptation and application of manure to the different varieties of plants, and more skill and care in the preparation and marketing of the crops than is usually practised in ordinary farming.

It is also a source of constant care to any one who carries on the business, and there exists a necessity of doing everything at the right time, no matter what the state of the weather may be, wet or dry. And there must be a constant watch kept for insects injurious to plants, so that they may be promptly exterminated, and before they have increased so as to render their destruction a matter of difficulty, or have done the garden much damage. And as compared with common farming it involves harder work, but is more profitable. In this business about the first thing to be done is to select a proper location, which should be near and conveniently accessible to a good market. Near, to save cost of transportation of the crops; accessible, so that it may be reached easily at any time. A variety of soils would be desirable, which should be free and deep for carrots, parsnips, and, in fact, for almost all crops, although cabbages and cauliflowers might perhaps be better on a heavier soil.

Having such a soil well broken up, it then becomes necessary to manure heavily, not what farmers who have never been in this business would call a good dressing, but at least ten or more cords of manure to the acre yearly; and the amount of profit will sometimes depend upon the outlay for manure, that is, the more manure applied, the more profit, up to a certain quantity, which quantity is seldom reached. And it is evident that it requires the same, or about the same amount of labor to plant and cultivate a crop only partially or stintedly manured, that it would if there had been a sufficient quantity applied, and the crop would certainly be less, and usually of a poorer quality, and therefore, if allowed to partially fail for want of manure, would be costly grown.

Then, as to the preparation of the land, the manure is to be of the right kind, and properly prepared, and should be intimately mixed with the soil, and the whole worked by the plough and harrow very deep, and completely pulverized, breaking all the lumps and reducing the whole soil to a fine tilth.

This is very important with beets, carrots, parsnips, and we may say for all crops; for with a soil hard and full of lumps we cannot grow good roots that are smooth and fit for market purposes, neither can we have good results with the other vegetables, without this fine tilth. There are some other crops, the onion for instance, which would be better with a much less depth of ploughing; but there must be the same fine tilth at the surface as with the other crops.

Having made this thorough preparation of the soil, we next come to the seed, and this is one of the most important things in the whole business of market gardening, and one perhaps as little understood and appreciated, except by the men most active in this business, and we desire to call the particular attention of the farmers and gardeners to this matter of seeds; and what we may have to say about garden seeds, will apply with equal force to the other seeds used by the farmer.

In the lecture of Professor Law, before the Board of Agriculture, at its recent meeting at Framingham, upon the breeding of domestic animals, he urged the importance of breeding from pure blood, and that by the admixture of bad blood a breed of animals would deteriorate, and for breeding purposes would become of much less value.

We would agree to that proposition in every particular, and would also say that it is just as true in regard to the breeding of vegetables.

There are pure breeds or improved breeds of vegetables, and specimens of such vegetables are as much superior to the miserable, mongrel stuff often grown, as a fine-blooded animal is to the meanest scrub to be found in Brighton market, and a person having a pure stock of any variety of vegetables, which he desires to perpetuate to improve and make still better, will be obliged to use the same nice care, skill and judgment, in the selection of stock to breed from, as that given by the best breeder of Shorthorns to keep his herd in perfection. Why is it that in our best markets you will always find some men famous for some particular variety of vegetables, while others will have inferior ones? Is it the cultivation, nature of their soil, and amount of manure applied that make all the difference in the beauty, smoothness and market value of their crop?

While admitting the great importance of soil, manure and cultivation in producing good crops, which we advocate as earnestly as any others, we are compelled to say that the men who grow the handsomest and best vegetables are the ones who use the best seed, and they cannot be grown in perfection without it.

And we can lay this down as a rule, that to grow good vegetables it is necessary to have *pure* and good seed.

Can good seed be readily procured? We think that it is a difficult matter to purchase just such an article of seed as our best gardeners use; but it is a difficulty which can in time perhaps be overcome.

Now, while we have no doubt that a majority of the seedsmen intend to be honest, and to do right, we think many of them do not look sharp enough after the growers of the seed they sell to their customers. If they did, we have no doubt that they would find some of them growing seed from poor, worthless, mongrel stock, totally unfit for market purposes. This they sell to their customers for good seed.

Let us illustrate this. A grower of seed plants the roots of two varieties of beets, the turnip blood, and the white Silesian or sugar beet, in the spring, for the purpose of raising seed, and in close proximity to each other. The result of this near planting is a cross breeding of the seed, and roots raised from this cross-bred seed will be neither turnip blood nor sugar beet.

This seed is sold to the seedsman, who in the course of his business sells to the farmer or gardener a sufficient quantity of this mixed stuff, which he calls turnip blood beet, to seed an acre, which crop he intends to sell in the market. He gives such cultivation as would ordinarily make a good crop. When he has done all this, and his crop is grown and secured, he finds, much to his loss, that he has a lot of mongrel stuff which is unfit for market purposes; and that, instead of being worth seventy-five cents a bushel for market purposes, it is only worth fifteen cents a bushel for cattle feeding.

Now, five hundred bushels is not a large crop of turnip beets to be grown on an acre. The difference in value at these prices would be three hundred dollars. One would not pay the cost of growing, while the other would pay well. The farmer then goes to the dealer and finds fault with him for selling bad seed. The seedsman will say that he bought it for good seed, but buying of more than one grower, probably could not tell who produced such poor stuff.

Now, who has to suffer for this bad seed? Why, the farmer of course; he is the one who has to stand all sorts of annoyances—bad seed, insufficient market accommodations, combinations of middle-men to get his rightful profits; and who, after giving all the care and expense necessary to produce a good crop, from his acre gets only seventy-five instead of three hundred and seventy-five dollars, simply from sowing bad seed.

This is not an overdrawn picture, and, as far as the growing of the seed is concerned, we have known precisely this thing. We have also known a seedsman to purchase a large quantity of marrow squashes on the field, in the vicinity of Boston, for the purpose of getting the seeds. This man did not take the precaution to see if other varieties of squashes were growing in the immediate vicinity, near enough to mix and spoil the whole. If he had he would have found on the other side of the fence different varieties growing in large quantities, which had surely mixed with and spoiled all the seed he had bought.

There can be no sufficient excuse for such gross carelessness, and the person who commits it is just as much to blame as if it was done with the deliberate intent to defraud and cheat his customers, and the injury done to the purchaser is precisely the same, whether there is carelessness or intent on the part of the seedsman.

These remarks, as we have before said, would apply to only a portion of the seedsmen. Some of them we well know are honorable men, who would not think of purchasing seeds of any persons unless they knew their reliability, and were satisfied that their stock to grow seeds from was right in every respect, and was raised at such a distance from any other variety of the same species as would prevent any mixture.

Go to the market gardeners of Arlington, and we do not hesitate to say that they are among the best, if not the best and most skilful market gardeners in this country; see with what care they procure their seed: first, they do as every farmer should do, that is, they intend to grow enough for their own use, so far as they can, either from their own or from the best selected stock they can procure. Second, if they do not have enough of their own, they buy of one of their neighbors who, they know, has the right sort. Third, they go to the seedsmen, and after making inquiries of all of them, to see if they cannot find some seed raised by a gardener who they are certain has the right stock, if they do find any such, you may be sure that they will take that.

We have stated this to show the extreme care they give to the selection of their seeds, a matter so important to them, and one upon which their success in a great measure depends.

We can all do something in this direction; and any intelligent farmer or gardener can certainly improve the grains or garden vegetables, if he goes about it systematically and persistently. Of course, it is a matter of time, and may not be completed in one or perhaps five years. And we should remember, that all variations of vegetables have, by a long course of cultivation and reproduction from the seed, been changed in some instances from a bitter, worthless weed to an edible plant, and that they are really in an artificial condition, and that the tendency of all cultivated plants is to return to their former wild state; and to counteract this tendency will require care and selection in this growing of the seed.

The planting of the seed in the open ground can be done best by using a drilling machine for most seeds. Some of these machines do the work well and expeditiously. Care should be taken to have the rows of a uniform width and perfectly straight, because sliding, scuffle or wheel hoes, and cultivators, can be adjusted so as to run nearer to the rows, and will do better and cleaner work than they can where the rows are crooked; straight rows also look better, and good looks are not to be despised in the garden or on the farm.

It will be necessary when sowing the seed to so adjust the machine that the seed will be planted and covered at a uniform and proper depth, which will vary somewhat with the different varieties of vegetables, and which it will be unnecessary to describe here. The seed having been planted, if good, it should soon germinate, and the plants be above ground. Now, there is hardly a variety of garden vegetable but that will be benefited by hoeing as soon as possible after it reaches the surface, because the hoeing will loosen the surface of the ground, which may have become crusted over and hard. The plants will grow better, and the weeds can be killed with half of the trouble and expense that they could be if left for a few days longer, and in many instances with much less injury to the crop.

We think the economy and importance of early and frequent hoeing, either is not well understood, or is not so commonly practised as it should be. Many neglect this, which is one of the most necessary things in good cultivation, both in the garden and on the farm, and make it their practice to wait until there is a good stand of weeds to hoe and pull up. The result is that the weeds are much harder to destroy, and the crop not so much benefited as it would have been by an earlier hoeing, and perhaps injured by the delay. The expense is also certainly increased by the above cause; in fact, we know of instances where the actual cost was less to hoe a piece of corn four times, when attended to in the proper time, than it would have been to have hoed the same piece twice after the weeds had become rooted strongly.

Then the advantage of frequent stirring of the soil in a severe drought, such as we have experienced the past summer, either by a cultivator or the hoe, cannot be too highly recommended, which, with the entire freedom from weeds, will in many instances save the crop from drying up, and sometimes becoming almost a total loss, and it will always make the crop better and larger in quantity.

We apply a quantity of manure to a piece land, for the purpose of supplying the necessary food to grow a crop. By this act we have invested in this piece of land a certain sum of money in labor, use of the land and fertilizers. Now, suppose we neglect to keep down the weeds; they absorb from the soil the fertilizers that we have been at so much expense to procure and apply, and these weeds, by their roots seize upon and take probably that very portion of manure, already soluble, and in the best condition for plant-food, which the expected crop then trying to establish or perfect itself may at this very time require. Our idea is this: that the manure becomes soluble and fitted for plant-food by degrees, and not all at the same time; and that portion which becomes soluble first is seized upon by the weeds, if they are allowed to grow, to the detriment of the crop, which oftentimes may need it at that particular time, to either establish or perfect itself.

Now, if this is so, and by any carelessness or neglect we allow the weeds to grow and overrun our crop, we should certainly fail to get any income from the investment we have made in labor, manure and use of the land. And therefore we can say that clean culture is one of the important things to be practised in farming; and in this branch of the business it becomes indispensable, and without it there can be no great success.

ROTATION OF CROPS IN GARDEN CULTURE.

There are two theories in regard to the failure or depreciation of the same crops where grown year after year on the same piece of land.

One of them is this, that plants exude from their roots excrements which render the soil unfit to a certain degree to grow the same variety of plants, until by a lapse of years that deleterious property has become neutralized. The other is, that plants exhaust particular elements from the soil, necessary for their growth, and that by supplying or returning the substances exhausted to the soil, the same variety can be grown indefinitely on the same piece of land. Both of these theories are advocated by scientific men, eminent as botanists and chemists, and they give plausible reasons on both sides in support of their respective views.

Now without undertaking to discuss these theories, which is unnecessary for us, as we intend to fall back squarely on facts, we come to this point, that in market gardening, as practised in Massachusetts, there cannot be any systematic rotation of crops adopted that would be practical, however desirable, owing to the limited number of acres cultivated by each individual, and the demand for certain varieties of produce in our markets which springs up suddenly, crops which it would be desirable to grow, and the want of which could not before seen in time to be arranged in any system of rotation.

Still there are rules, governed by facts, that must be observed to be successful in the change from one crop to another on the same piece of land.

Or to speak more to the point, experience and facts have taught the best gardeners that cabbages, turnips and pease certainly should not be grown on the same piece of land without an interval of at least two or three years; and although in some cases they have been grown successfully for a number of consecutive seasons on the same land, that would be the exception, and not the general rule; and this interval should be occupied by some species of plants entirely distinct from each of them. This rule probably would apply to all garden vegetables, some perhaps to a greater degree than others. Onions may be an exception to this rule, but that is doubted by some of the best gardeners. Dr. Daubeny (see "Book of the Garden," published by McIntosh) has put this to test by causing plants to grow on the same land and on different plots in successive years, and noting the results, which were as follows, taking an average of five years:—

Potatoes,	in the same plot,	72.9	lbs. tubers
	in different plots,	92.8	"
Flax,	same,	15.0	"
	different,	19 9	"
Beans,	same,	32.8	"
	different,	34.8	"
Barley,	same,	30.0	"
	different,	46.5	"
Turnips,	same,	104.0	"
	different,	173.0	"
Oats,	same,	28.0	"
	different,	32.4	"

This shows a manifest advantage in shifting crops, varying from one to seventy-five per cent.

The most successful market gardeners understand this necessity for changing crops perfectly well. One of them recently said that he would not plant a piece of land to cabbages the second year, even if the use of the land and an abundance of manure were given to him for nothing, for these reasons: first, that the previous crop of cabbages had left something in the soil which would prevent his obtaining a crop worth harvesting, no matter how well manured; and that if two lots adjoining were ploughed crosswise, on one of which there had been grown a crop of cabbages, that the small quantity of soil carried by the plough from the lot on which there had been cabbages, to the other, would; injure that lot to a distance of six to ten or more feet, so as to unfit that extent of land for the growth of that particular crop; and, secondly, that there would be much more annoyance from insects on the old than on a new lot, which is another important consideration.

Now if this is true, and we do not see any reason to doubt it, it would indicate that there was something left in the soil by the cabbages that was detrimental to a future crop of the same plant, and it is evident that the adjoining six to ten feet had not been exhausted of the particular element required for the growth of the cabbage.

However that may be, the experience of practical men engaged in gardening has demonstrated that success will in a considerable measure depend upon changing the crop frequently upon the same land.

In harvesting, all varieties of vegetables are better for being carefully handled; breaking or bruising them injures their keeping qualities very much. Therefore they should be carefully gathered, trimmed, washed or otherwise prepared, and sent in tidy, clean and attractive packages to market, for when so prepared they will sell quicker and at a better price.

And it is very important when vegetables are to be stored and kept, either for family use or a late market, that they should be sound and entirely exempt from disease or injury in any form: for if they are stored with any defective ones among them, it will not only cause their decay, but will rot others near them.

All varieties of vegetables having succulent leaves or tops, as celery, asparagus, cauliflowers and some others, are particularly susceptible to injury from such treatment, and would have to be sold at a much less price in any good market, if injured in that way.

Now is there any feasible plan by which the farmers and gardeners of Massachusetts can be supplied with the best of seed? We think they can in time, with certain varieties, and in this way, and by the Agricultural College farm. They have an abundance of land, in our judgment particularly well adapted to the production of seeds, and of plants to grow them from, if put into the right condition by good cultivation. Let them in the course of their farming raise fields of wheat, oats, rye, barley and corn of the grains; beets, carrots, parsnips, onions, turnips, cabbages, squashes, potatoes, or as many of them as would be desirable; let them use only the best pure-bred stock adapted particularly to cultivation in Massachusetts to propagate from, continue to select their seed grain and their roots to grow seed from with the utmost care, using such only as come up to their standard of perfection, which should be of the highest order. Then give to them the best cultivation possible, for cultivation stands in precisely the same relation to plants, as care and feeding do to cattle, and the principle so well established in breeding animals, that like produces like, would be as certainly exemplified in the vegetable as in the animal kingdom.

Now having complied with these conditions, what can we reasonably expect? Why, that the crops of grain will be larger and of much better quality than they have ever produced on the college or on the neighboring farms, and being better than the farmers have, there would be a great demand for seed. This would apply also to seeds to be grown from the other vegetables named.

What would be the result to the college if this plan should be systematically and practically carried out, and the institution had established a reputation for the best seed? Why, that the value of every acre of grain grown on their farm would be worth more than double for seed what it would for feeding purposes, and that the proceeds of the sales would buy twice as much grain to feed to their stock. The same results would be attained, only in a much more profitable ratio, in the production of seeds of the other vegetables named.

Then the farmers of Massachusetts could get seeds of the usual varieties of crops grown here of the best quality, and such seeds properly planted and cared for would produce a good crop of a first-rate article, which would be entirely satisfactory.

The buyers would be willing to pay a first-rate price, and if it was one of the market gardeners, to whom we have referred, he would say, I don't care what the price is, if I can only get what I want. He knows well that the price of seeds, no matter how high, is *cheap*, if good. It would be a source of revenue, and not a small one by any means, if managed properly, to the college, and one of the means by which that institution would be made self-supporting and useful. It would create an opinion among the farmers that the Agricultural College is an institution where their sons can get a *practical* as well as a theoretical education. That belief is to-day wanting among the great mass of the farming community in this State. Let us by some plain and practical results, such as we have named, create such an opinion; and when we have done that, anything reasonable that the college might ask the State for, backed as they certainly would be by the great mass of the farmers of this good old Commonwealth, would be granted readily.

And in conclusion your Committee desire to call the attention of this Board to the great importance of having a supply of good seed, free from dirt, chaff, thistles and weed seeds.

And we would therefore recommend that field and garden seeds should be one of the subjects to be referred to one of the standing committees for the next year.

John B. Moore.
Avery P. Slade.
N. P. Brown.

The report was laid over under the rule, when Mr. Bassett, on behalf of the committee on that subject, submitted the following Report upon the

VALUE OF A REGULAR SYSTEM OF FARM ACCOUNTS.

The subject assigned your Committee, viz., "On the value of a Regular System of Farm Accounts," is one which, perhaps, has not received the attention which its importance demands; but before expressing any ideas directly upon the subject, let us glance for a moment at the position the farmer occupies in the community.

It is undoubtedly true that no department of business is more independent and honorable than that of agriculture. The farmer occupies a little world of his own, out of which he is not necessitated to go, either for the necessaries of life, or for a practical knowledge of the various departments of business which make a busy, thriving world. He may find on his farm manufacturers more wonderful in the textures which they weave, and more delicate and beautiful in the machinery which they employ, and more various in their products then can be found in all the artificial life of the world outside of it. The farmer is a manufacturer on the grand and yet simple plan of nature. The products of his mills, too, are reliable. He can warrant the article which he throws upon the market to be what it purports to be; no shoddy constitutes a portion of his merchandise; hence, he needs blush before no man who chooses to examine the texture of his goods. He knows that his looms and all his machinery are perfect. The Superintendent or Overseer is infinite in wisdom and power, and the materials from which his products are made such as to enable him to say, this is an unmixed product. The farmer is also the merchant to dispose of the products of his manufactures, both wholesale and retail. A part he turns out upon the market to be carried far and wide, to be again retailed by the vegetable merchant to the consumer; a part he retails to himself to be consumed in his own family, or in his own yards, among his fowls, his cattle or his swine. The farmer is his own carrier; while the merchant employs the commerce of the sea or the land to transport his merchandise to and from his warehouses, the farmer has his transportation all in his own hands or under his immediate control. The farmer, too, is his own day laborer, while he is an extensive manufacturer, employing an infinity of machinery, and a stirring, busy merchant, driving a brisk and complex trade, and an earnest and energetic carrier. He is also the toiler in the field, "eating his bread by the sweat of his brow." And yet, notwithstanding the farmer occupies such a position, and this is such a complex, honorable and independent department, how very few there are engaged in it who employ any regular system of accounts in the management of the farm interest. What would we think of the manufacturer or the merchant who kept no account whatever of the cost, or even the amount of stock invested in his business? the manufacturer purchasing his raw material and converting it into cloth, and disposing of the same without the knowledge of the cost of production, or proper calculation as to the right stock adapted to the machinery and power of mill, or the merchant doing his business hap-hazard, hoping, without a foundation for his wishes, that he is selling his goods so that he will secure favorable results in due time, or at least that he is not eating up his capital; we should not consider them judicious managers, their credit would be below par; we should not want them as guardians for our children, or appoint them our executors.

But how is it with the farmer, combining as he does in himself the manufacturer and the merchant, and the carrier and the laborer,—is it customary for him to keep a systematic account of the various departments of his business? No; most of our farmers are lamentably lax in this matter; not one in a hundred can tell you the exact cost of raising a bushel of corn or a ton of hay; they sell the product of a field, after they have taken from it the family supplies, and call it all profit. They do not know how much the product has cost them. It is a question if one farmer in a hundred in New England can tell the exact cost of running a farm a year. Now if the manufacturer and the merchant find it so much to their advantage, so absolutely important that their accounts must be kept with the strictest method in their one line of business, why may not the farmer expect to derive as great advantage in a systematic account of the cost and product of his fields? Why should the farmer go on year after year raising one kind of grain, when a little calculation of the cost and product of another kind would bring double the profit? Why should the farmer furnish his mills with raw material in the shape of manures and tillage, &c., at the cost of double that which may produce a better article? It is true, a systematic agricultural account would, of necessity, be somewhat complex, and at first perplexing, but not beyond accomplishing; and it is evident that in the end it would be immensely to the advantage of the farmer. For instance, if the farmer should keep an accurate account of the cost or value of the manure, and the labor and the seed expended in his corn-field, then, on the other hand, know the exact product of the field, he could easily estimate the profit or loss in raising corn, and could then compare corn with potatoes,—then a portion of this, instead of being converted directly into money, is consumed by his family, a part is fed out to his poultry, a part to his hogs or to his cattle. Here then we say, he has three classes of merchandise. By charging to the poultry, the hog, or the cattle the market value of the corn and other materials given them, he can approximate near enough for all practical purposes to the cost of converting grain into meat, and will be able to judge in regard to the most profitable way of disposing of his corn-field, whether to sell it in bulk, or work it over into some mixed commodity which will give him greater profit. In this way he may realize (depending to be sure something upon the markets) more profit on the first expenditure. In like manner should he manage each department of his farm—his hay, his potatoes, his rye, oats and barley, apples and fruits of all kind, cattle, sheep, horses, poultry and dairy—let all be charged with their appropriate expense of producing; which only can be done by a regular, systematic account; and then, by looking to his account, he can tell you the exact cost of every article of his merchandise, and the best mode of disposing of it, or of working it up. In fact, he is a merchant farmer. He does not get all his wealth out of bone and muscle; some of it, and a large portion, comes out of his brains.

Now some of the advantages to be derived from this system of accounts by the farmer are—

1. His intelligence. He knows something about farming that he cannot learn in any other way. He knows the cost, or very nearly, of every product he throws into the market, and if we estimate the value by the cost, he knows the worth of the article; at any rate, he knows whether it pays to raise corn or potatoes, or hay. He will know too which this field is adapted to produce. Now, a farmer in a hap-hazard way thinks he

knows that the product of his farm this year has been favorable or unfavorable ; but not many would know whether this identical field has done the best it could ; perhaps corn or wheat would have done better here than potatoes. A few years of testing this field in this methodical way would give him a knowledge of the capability of this ground, which he could not otherwise obtain (and so of all the items of the farm), and learn its wants and capacity.

2. It would promote increase in his products. Very soon he would not be growing corn on land adapted to produce some other grain, or perhaps hay. You would not see his hay-field turned into pasturage, nor a corn-field on the north side of a hill where there was a south side, which he could cultivate just as well. Neither would you find his barn full of cows of an indiscriminate quality, nor his pigpen full of scurvy swine, nor his hen-house cramped into the north corner of his barn cellar. He would be likely to arrange his outlays so as to reap the most profit.

3. Neatness and order about the farm. Let a farmer keep an exact account of outlay and income, and it will promote economy in every department. He will soon learn that an untidy yard is a constant bill of expense ; that rickety fences, broken-hinged gates and swinging barn doors require looking after ; that fences, gates and doors should be made of good materials well put together. Hay wasted in the barnyard is a loss. An unpainted house or barn wears out faster than one well painted and cared for. Ploughs, harrows, harnesses and carriages last longer when well cared for than when exposed to all kinds of weather, and generally he will learn that economy requires neatness.

4. He will find that method in his accounts will promote the spirit of inquiry into the best methods of agriculture ; he will not be satisfied with the corn in one end of the bag and the meal in the other, because his father did so ; he will be stretching his experiments out into the unknown and reaching forth to those things which are before, and so he will not only be teaching himself but others also ; he will be a discoverer. He will want to know if some kind of manure cannot be manufactured which will fertilize more ground than that which he and his father have used ; he will be inquiring whether this plough or that harrow cannot be improved so as to do more and better

work in a given time, and so in any item of his farm he will push his investigations outward, and enterprise and thrift will mark all his actions, and generally the farmer will be more successful, just as the manufacturer or merchant is more successful who knows exactly every day just how his account stands with the world.

We are not called upon, neither have we attempted to give a definite, detailed plan how the farmer should keep his accounts; but we have aimed in what we have said to throw out some hints, which if followed would, we think, prove the value of a "Regular System of Farm Accounts," because it would necessitate *order*, *method* and *system* in all that pertains to the managing of a farm.

CHAS. C. BASSETT, *for the Committee.*

The Report was read and laid over under the rule, when the Board adjourned.

THIRD DAY.

The Board met at ten o'clock, A. M., Hon. ALBERT FEARING in the chair.

Present: Messrs. Agassiz, Allis, Baker, Birnie, Boise, Bradford, Brown, Bucklin, Clark, Converse, Davis, Durfee, Ellsworth, Fay, Fearing, Goodman, Hubbard, Hyde, Johnson, Knowlton, Ladd, Loring, Moore, Peck, Phinney, Saltonstall, Slade, Stone, Stockbridge and Ward.

Mr. BRADFORD, Committee on Credentials, submitted the following

REPORT:

The Committee to examine the credentials of new members would report that the following gentlemen have been elected, viz.:—

LEVERETT SALTONSTALL, . .	By the Massachusetts Society.
JONATHAN LADD, . . .	Middlesex North.
FARWELL F. FAY, . . .	Worcester North-West.
NEWTON S. HUBBARD, . .	Worcester South.
ENOS W. BOISE, . . .	Union.
THOMAS L. ALLIS, . . .	Franklin.
LEVI STOCKBRIDGE, . . .	Hampshire.

S. B. PHINNEY, . . . By the Barnstable Society.
HERMAN VINCENT, . . . Martha's Vineyard.
(Signed) LEWIS H. BRADFORD,
Committee.

Mr. BAKER reported as delegate upon the Highland Society, and Dr. LORING upon the Housatonic.

Mr. HUBBARD presented the following essay upon the

USE OF CAPITAL IN FARMING.

In considering this subject, two important questions are involved. First, would it be wise to abandon the farms of New England, as some are doing, and give up its agricultural interests? If so, the second question, as to how they shall be carried on, needs no consideration.

I shall assume, and not only assume, but lay it down as a fixed fact, that it is the most unwise policy that can possibly be pursued. Agriculture, commerce, manufactures and the mechanics arts must go hand in hand. But the agriculture of a nation is its chief corner-stone, the very foundation on which the whole structure stands. Strike out this and the whole edifice will crumble and fall. It is the main-spring which moves the whole machinery and gives vitality to all other industrial pursuits.

In following out this question, I suppose we are to be confined more particularly to the agriculture of New England, or our own State. In 1620, the first settlers found their way to our shores and settled at Plymouth. Ten years later commenced the settlement of Boston; and from that time to the present the population has been increasing and spreading over every part of the State. During all this time its industrious and persevering inhabitants have turned their attention to the various occupations that have presented themselves, until with some there seems almost to be an idea that farming is of little consequence, and may be abandoned, and that young men coming on to the stage of action must look for something more lucrative and that will bring its returns without much effort. A continual repetition of anything becomes so impressed upon many minds that it becomes to them a reality. And the saying that "farming don't pay" has been so often repeated, that to many it has become a willing reality, and has afforded them a plausible excuse for quitting the farm.

Said a young man who was well situated on a farm, when asked why he left it, "I thought I could get a living easier," and various other reasons, but finally said, "To tell the truth, I am too well educated to be a farmer." What an idea. Too well educated! If there is any branch of industry that needs intelligence, that needs a mind well cultivated, so that it can comprehend new ideas as well as originate them, where men can adapt themselves to their various localities and surroundings, that branch is farming, without doubt, for it certainly needs a class quick of thought, and prompt in execution. With almost every branch of business, definite rules can be laid down that will answer for all localities. Go to the manufacturer and ask him what he can manufacture woollen cloth of a certain quality for, and he will calculate the cost of the raw material, the capital invested, the cost of labor in the process of manufacture, and all other expenses connected with it, and he will tell you to a cent what it can be done for. Go to the architect and ask him the expense of erecting a building of a certain size and finish, and he will go from foundation to roof, and tell you what it can be done for; and so with almost every branch of industry until you come to the farmer. And can he tell you what a pound of beef or pork can be made for; what a pound of butter or cheese can be produced for; what a bushel of oats, wheat or corn can be grown for; what our garden vegetables, fruits and all the luxuries of our tables can be produced for? Certainly not. There are various influences at work day by day, from the time the seed is put into the ground, until we behold the ripened fruit. We watch the tender plant, the blossom, the first appearance of fruit, and all its various stages until the golden grain or luscious fruit is ready for our use. During all this time we look for the early and latter rain, for the warm and genial influences of the sun. If these are bestowed upon us, and we use those faculties God has given us, we can rejoice in the fruit of our labor.

Nowhere is there such an opportunity for thought and reflection. The book of nature is constantly open before us, so that the mind that does not continually read from its pages, must be shut up to all those loftier and nobler feelings of our nature.

And if it were true that he did not receive as many dollars, he has what is far better, a healthful and vigorous constitution, a mind not bound down with the cares and perplexities of the business man, who is on a continual stretch of anxiety lest his goods and wares should decline while on his hands, or lest some of his customers should not be prompt in their payments. The farmer lives so far within himself, that he is subject to few of these perplexities. The politician is dependant upon the votes of the people. And if he secures an office, there comes more of responsibility than was anticipated, and less of real enjoyment.

I have said that we often hear the saying "farming don't pay." Do we hear it said mercantile business don't pay? And yet how small a per cent. of merchants really succeed in their business. Still the business is carried on, and some grow vastly rich. Stewart of New York commenced by dressing and selling pieces of cloth used as samples, for which he obtained a profit, and as his means increased he increased his business, and by his skill, indomitable energy and perseverance has acquired an immense fortune. Fisk, from driving a peddler's wagon from house to house to display and sell his goods, went to stock speculations, and has the reputation of possessing a large fortune. But is the world richer or better for it? Vanderbilt, who earned his first ten dollars by rowing a boat to carry a man to a certain place, and returning him safely when the elements were in such commotion that few would risk their lives in the undertaking, showed such skill, such courage and perseverance, that he was employed to run a steamer, and has acquired a princely fortune. Such cases, though few, seems to dazzle the eyes of young men about to start in life, while thousands of others where the process is slow, but much more sure, are passed by unnoticed.

Said Henry Ward Beecher, "Many young men get the idea that in the city fortunes go around begging persons to take them." He says also, "It would promote the morals of the nation if the city were to vomit out one-third of its young population." I have said the population of Massachusetts is increasing, and this increase is mainly in the cities and large towns. With this increase of population, there is an increased demand for the products of the farm, which must be supplied from our own agricultural industry, or from some other section of the country. Shall we go away for our vegetables? We need not to find a soil that will produce them bountifully, and being grown so near a market, they will find their way thither in a perfectly fresh and healthy condition. And if the plant-food that goes to waste in our cities, could be turned back to increase the fertility of the soil, we should be blessed with far richer harvests. Shall we abandon fruit in Massachusetts? Who that has visited our agricultural fairs in the various sections of the State, and beheld the various varieties of fruit exhibited, with a richness of flavor unsurpassed, and in quantities sufficient to satisfy the most fastidious, will say we need go beyond our own borders for fruits adapted to our climate?

If we turn our attention to the dairy, we find many sections as well adapted to the production of milk, butter and cheese, as any part of the habitable globe. The supply of milk must be produced within a reasonable distance of the place where it is consumed, so that the Eastern cities cannot go West beyond the borders of our own State for their supply. And even if this could be done, would it be a wise policy for the producer or consumer to pay the expense of transporting those articles of food which can just as well be produced in his own immediate vicinity? As the manufacturing, mechanical and mercantile population increases, the question comes with great force, whether the farming community should not redouble their diligence to keep pace with this increasing demand for the products of the soil? I have spoken of milk, but I have yet to learn that better butter or cheese can be found than is made in our own State. In those portions where the feed is abundant, and pure water never exhausted, cheese factories have come up and are rapidly increasing, and the quantity of cheese from them is annually increasing. With these facilities, and a ready demand for all that can be produced, is there any reason for the oft-repeated saying, that "farming won't pay?" If the farming interest does not pay, what business does? If the agricultural interests are checked, where is the prosperity of other branches of industry; and from whence comes the revenue of the country, if not directly or indirectly from the soil?

A division of labor, or specialties in farming, renders it more remunerative, as well as more pleasant. Heretofore, almost every farmer was attempting to do a little at almost everything connected with his business, and carrying nothing to so great a degree of perfection. He has finally taken lessons from the professional man, the mechanic, the manufacturer, and other branches of industry, and is making one prominent department lead, while all others are subservient to this. The fruit-grower makes a specialty of fruit, and we see his orchards and vineyards showing evident marks of careful culture. He knows the best varieties of fruit for his location; the best market, and the best mode of getting his fruit to market. The market gardener also knows the best soil and manure for the different varieties of vegetables, the preparation of the soil, the proper time for putting in the different seeds for early and late markets, the care each must have, and the time and mode of getting his products to the best market. The professional man does not engage in all the professions at the same time. The manufacturer of cotton goods bends all his energies in that direction. He builds his mills for this one purpose, supplies himself with machinery for doing this work, and seeks for his best market for procuring the raw material and selling the manufactured goods. The woollen manufacturer does not trouble himself about others, but is devoted to his particular branch. And so it is with all the various trades. The blacksmith does not have a dry goods store connected with his shop, or the shoe-maker carry on the goldsmith's business; but each one in his separate department finds a greater success. So the farmer finds a greater success when one branch leads, and all others succumb to that. I do not mean, if the farmer gives his attention to dairying, he should do nothing else, but that this should be his leading pursuit, and should not be neglected for anything else. He may raise corn, potatoes and vegetables, but all looking to the improvement in his one particular branch.

Having given some reasons why it would not be a wise policy to abandon our agricultural interests, and having touched at some length on the division of labor, we turn more particularly to the manner in which this should be done in order to make it most remunerative. The first investment necessary is a good education,—one that will tend to fit us more particularly for this branch of industry. I have said that no man can be well fitted to manage different departments of business, and be successful in all his operations. The doctor cannot be a successful farmer, and at the same time be thoroughly versed in the practice of medicine. Nor could the farmer leave his fields and flocks and herds, and be a successful lawyer. The preacher of the gospel, if he would be strong in his profession, cannot be a successful merchant or manufacturer. Life is too short to attempt a thorough knowledge of all, or any considerable number of the different branches of business. Blot out the idea that some entertain, that any one can be a farmer, whether he knows anything of his business or not. I am glad it is becoming more and more exploded, and the desire for agricultural knowledge increased. We have our agricultural papers, books and lecturers, who are scattering information broadcast over the land. We have our agricultural societies, which are schools of object teaching, schools of experiments, schools where we can get an interchange of ideas, and a new impetus in the great work of agriculture. We have our "Board of Agriculture," and our valuable Secretary, who is not only giving the community the benefit of his own intelligence, but is collecting the researches of others for the benefit of all who desire such information. We have also our Agricultural College, which in prosperity has far exceeded the expectations of its most sanguine friends, and from which we soon expect to see a class of young men educated especially for the business of farming, and who by the application of science to the art of agriculture, will, we trust, inaugurate a new era, when there will be an attractive, instead of a repelling force operating on the minds of young men. After acquiring what theoretical and practical knowledge a young man can in the business of his choice, he either has a farm left him or seeks to obtain one for himself.

Now comes the decision as to how much land he will have. This will depend upon what particular branch of agriculture he is to pursue. But whatever it may be, he must use capital enough, so that the proceeds will more than balance the expenditures of the family and the cost of cultivation. If market gardening or the raising of small fruits is to occupy his attention, less acres are needed. If the raising of grain (which we could hardly recommend as a specialty in Massachusetts), he would need more land. If in the dairying or stock growing sections, a larger farm will afford a better profit. The expenses of a family on a small farm are nearly as much as on a large one, with the exception of increased labor. Horses, carriages, and the implements of husbandry are nearly the same in the one case as the other. If it requires the income of six or eight cows to meet the necessary family expenses, the ninth and tenth cow, and so on to a much greater number will be largely profit; so that in whatever branch we engage, see that the income exceeds the expenditures. If this is not done we may well cry out "farming don't pay."

Should the manufacturer do but a small amount of business, could he say that manufacturing paid? He builds large mills and finds the same wheel will turn a large as well as a small number of spindles, so that cloth comes out in large instead of small quantities, and if the profit is but small per yard a large income will be realized. To do this, capital must be invested or there will be no profit above expenses. Just so in farming. Enough capital must be invested so that the foundation will be broad enough to build upon, and then the necessary labor must be performed in the most economical manner. To do this requires still another investment. The best tools must be brought into requisition, and all the machinery that can be worked to advantage. The mowing machine, tedder and rake, now so much in use (and their use is spreading farther and wider every year), render that part of farming which was formerly the most laborious and expensive, comparatively easy and less expensive, so that grass can be cut and cured so much more rapidly as to render its nutritive qualities far greater. When all the labor was performed by hand, I have known haying to linger till nearly September, when the hay was hardly worth the expense of getting.

But some one says, My farm has too many rocks and is too uneven for machinery. Only on a small proportion could it be used successfully. When the Boston and Albany Railroad was in contemplation there was but a small proportion of the route that was perfectly level. The hills had to be brought low, the valleys raised and the rough places made smooth. And did it not pay to do all that? Nothing could have been done successfully without it. Grant that your farm may have rocks and rough places. You will by the use of machinery make a better farmer; you will more readily see the rocks that obstruct your way, and the rough places that with a little capital can be made smooth; and some part of the time when other things do not drive, you will turn your attention in that direction, and when once accomplished you will be surprised that you did not do it sooner, and your courage will be increased from year to year to do more, thereby rendering the land more productive and at the same time easier of cultivation. We take no steps backward in civilization or improvement. Things may look formidable at first sight, but when fairly met the battle is half won, and what were supposed to be almost impossibilities are readily overcome.

One of the great obstacles in the way of successful farming was the great labor and care of the dairy. At early morn the dairy-woman was seen at the cheese tub, which would hardly be left until the sun had reached its high meridian, added to which was the care of the cheese already made. This would sometimes bring discouragement to the dairying community. But we have arrived at a new era in this department. With the use of a small capital in the erection and furnishing of a cheese factory, the milk in a circle of from four to six miles is brought together, and there manufactured into cheese with an economy almost as great as the present manufactory of cloth over the primitive times. These, although of recent date, are as sure of permanency as the cotton factories now scattered all over New England. Who that has had experience with cheese factories would desire to return to the old system of cheese making? And yet it requires capital, energy and perseverence, for advancement in this direction and all the departments of farming, as well as in all the various industries to which the attention of man is called. And no one will succeed here or anywhere else who is not willing to put his shoulder to the wheel, and who does not feel that he has a business that is best for him, and one in which he is determined to succeed.

What should we think of a merchant who should stand at his counter and complain to his customer that his business did not pay? Should he take that course, it probably would not pay. We should all say, do not spend your breath or energy in that direction, but by the investment of a sufficient amount of capital, and a close attention to your purchases and sales, and feeling that you have a good business, *you* probably will be among the successful ones. Just so with every branch of business. The energetic, the industrious, the persevering, will succeed. Said Governor Bullock at the reunion of the legislature of 1862, after extolling that assembly of representative men in high terms, "I ought not to conclude this strain of partiality for one popular assembly without admitting that there are at all times those in our community whose measure of wit and satire is satisfied in speaking of the general court in terms quite the opposite of those I have learned to use, but I think you rarely find one of those persons who was ever known to decline an opportunity of election to the House or who would be eminently useful if he should happen to be chosen." There are those who are constantly croaking and complaining, who are ready to say they wished the rich were obliged to divide with them. Would this change their character? Would they not still complain, and five years hence call for a new division? Let every man leave his neighbor and attend to himself; leave his neighbor's business and attend to his own. Let every one strive to make the world richer and better, that he has lived in it, and we should hear less of the complaint that "farming won't pay." Try it, and try it with a feeling that it does pay.

The sacred page tells us that, "He that tilleth the land shall have plenty of bread." We find this to be the first business of every nation, its main support. If this fails, all fails. All must have their daily bread. If the land does not produce, the merchant cannot move his goods, ships would rot at our wharves, steam cars would not stalk through the land; in fact, all other business would be of no avail. But with a productive soil, and careful and well directed labor, all the other industries will flourish. Agriculture was the first business of Massachusetts, as of the nation; and with the stand she has taken in the history of the nation, with the influence she has exerted through its whole length and breadth, and the world, in a moral and intellectual point of view, with her common schools and other institutions of learning, with her charitable institutions, with her men, who from the earliest history of the nation to the present time have sent their influence far and wide, who have taken the lead in all the industries of the nation,—shall we abandon her agriculture, and allow her to decline in this direction? No. For the honor of the old Bay State and the good of her teeming population, let all friends of agriculture bestir themselves, so that Massachusetts shall bud and blossom as the rose, and yield her increase for man and beast. I am glad that the idea has to so great an extent vanished, that all we need for a farmer is bone and muscle, a strong physical frame, without that motive power which underlies all our action, which plans and carries into execution well directed labor.

An engine may be built very strong, every part as perfect as the skill of man can make; a road may be graded, the hills may be brought low, the valleys raised, the rough places made smooth, the track laid and the engine placed upon it. But does it move? Not until the motive-power is applied, with man's skill and knowledge to direct all its movements. Who attempts to argue that a man can make and manage a steam-engine without being educated for that purpose? Who attempts to say a man can practice law without a knowledge of law, or a physician medicine, without a knowledge of the diseases flesh is heir to and the remedies to be applied, or our teachers to attempt to give instruction in those branches of science of which they have no knowledge? From whence is this knowledge derived? From teachers, from books, from the experience of others, from our own observation; and then, in the application of those principles to practice, we still gather fresh information, for it is said "we never more than half know anything, until we are able to explain it to others."

Shall we discard in agriculture what we claim everywhere else? This, it seems to me, is not a wise policy. Expel the idea that is in the minds of many, that to educate a young man is to give him a distaste for the farm, and unfit him for farm labor. But the opposite, that a theoretical knowledge is essential, and then an application of the principles he has learned to practice, and with a mind educated, he will be continually drawing from his own resources and from the researches of others. In this way shall it not be thoroughly demonstrated, that knowledge and the use of capital are as essential to the prosperity of agriculture as to any other branch of industry?

N. S. HUBBARD.

The report having been read and laid over, the Board proceeded to the assignment of delegates to attend the various agricultural societies, as follows. To the

Essex,	JOHN T ELLSWORTH.
Middlesex,	E. STONE.
Middlesex North,	A. P. PECK.
Middlesex South,	ALBERT FEARING.
Worcester,	THOMAS L. ALLIS.
Worcester West,	GEORGE B. LORING.
Worcester North,	JOHN JOHNSON.
Worcester North-West,	N. S. HUBBARD.
Worcester South,	L. SALTONSTALL.
Worcester South-East,	A. J. BUCKLIN.
Hampshire, Franklin and Hampden,	WM. KNOWLTON.
Hampshire,	J. F. C. HYDE.
Highland,	H. VINCENT.
Hampden,	L. H. BRADFORD.
Hampden East,	N. P. BROWN.
Union,	GEORGE M. BAKER.
Franklin,	LEVI STOCKBRIDGE.
Berkshire,	JONATHAN LADD.
Housatonic,	HIRAM CONVERSE.
Hoosac Valley,	A. P. SLADE.
Norfolk,	F. F. FAY.
Bristol,	RICHARD GOODMAN.
Bristol Central,	THOMAS W. WARD.
Plymouth,	WILLIAM BIRNIE.
Hingham,	JOHN B. MOORE.
Marshfield,	E. W. BOISE.
Barnstable,	GEORGE B. LORING.
Nantucket,	S. B. PHINNEY.
Martha's Vineyard,	WM. S CLARK.

Mr. DAVIS, from the Committee appointed to consider and report upon the time and place of holding the country meeting of the Board, reported in favor of holding it at Fall River, on the 21st, 22d and 23d of November.

The Report having been accepted after discussion, and adopted, it was

Voted, To appoint a Committee of five on Meetings. This Committee was constituted by the appointment of Messrs. Durfee, Slade, Davis, Goodman and Phinney.

Voted, To change the time of holding the Fair of the Union Society to the last Thursday and Friday but one in September.

Voted, That no society receiving the bounty of the State shall, after the present year, bestow any premiums or gratuities on grade or native bulls.

Voted, That any society joining with the New England Agricultural Society's exhibition have authority to change its time to conform to that.

Dr. LORING, from the committee appointed to select a list of subjects for investigation, submitted the following preliminary

REPORT:

They would recommend that the members of the Board be directed to prepare accurate and elaborate statements of the condition of agriculture in the various sections of the Commonwealth, and that a list of questions be prepared for their guidance in the preparation of these reports. In making this recommendation, the Committee would be understood as confining each delegate to the locality included in his society.

(Signed) GEO. B. LORING.
JAS. F. C. HYDE.
W. S. CLARK.

This Report was accepted and adopted, the questions to be prepared by the committee, to which the Secretary was added.

A paper was presented by the Secretary, as the First Annual Report of Dr. Packard, as the Entomologist to the Board, to which position he was appointed at the Amherst Meeting of the Board in August last.

Voted, That the thanks of the Board be presented to Dr. Packard for his valuable paper on insects, and that it be published in the Secretary's Report.

The Committee on Printing was constituted by the appointment of Messrs. Goodman, Moore and the Secretary.

The Examining Committee of the Massachusetts Agricultural College was constituted of Messrs. Agassiz, Fay, Knowlton, Hubbard and Johnson.

Voted, That the various Agricultural Societies of the Commonwealth, be requested to organize an annual meeting for lectures and discussions at such time and place as may be convenient to each society; these meetings to be denominated The Farmers' Institutes of Massachusetts.

Adjourned.

FOURTH DAY.

The Board met at ten o'clock, A. M., Mr. PECK in the chair.

Present: Messrs. Agassiz, Allis, Baker, Birnie, Boise, Brown, Bucklin, Clark, Ellsworth, Fearing, Goodman, Hubbard, Hyde, Johnson, Knowlton, Ladd, Loring, Moore, Peck, Phinney, Saltonstall, Slade, Stone, Vincent, Ward and Wilder.

Dr. LORING, from the Committee to select and assign a list of subjects, submitted the following:—

The Breeding of Domestic Animals.—Messrs. Agassiz, Loring and Hyde.

Field and Garden Seeds.—Messrs. Moore, Hyde and Clark.

The Cultivation and Use of Forest Trees.—Messrs. Clark, Goodman and Durfee.

The Cultivation and Preservation of Fruit.—Messrs. Wilder, Fay and Hubbard.

The Management of the Dairy.—Messrs. Ellsworth, Allis and Phinney.

Agricultural and Horticultural Education for Women.—Messrs. Goodman, Wilder and Birnie.

The Report was accepted and adopted.

Voted, That each society receiving the bounty of the State be directed to publish a catalogue of its members, in connection with the Transactions of the present year, and that, in arranging this catalogue, the occupation of each member be set down against his name.

Mr. JOHNSON submitted an essay on the

TIME OF CUTTING AND MODE OF CURING HAY.

It will doubtless be remembered that we presented a rather hastily written essay upon this subject (by appointment) last year, and that it excited a discussion which continued for several hours, when the whole matter was recommitted, with the names of Messrs. Saltonstall and Ellsworth substituted in the place of Cole and Blair. At the time the Board met at Framingham, December last, Mr. Ellsworth examined some hay, and was invited to write the committee in regard to his opinion on the whole question, that it might be incorporated in this report. We received a line from him a short time ago referring to an address of Mr. Hyde of Lee, read before the Board at Amherst, in 1868, as comprehending his own views.

This was a very clear, comprehensive and elaborately written document, recommending as the best time to cut herdsgrass and red-top, when it is in full bloom; and red clover when about half the heads are in blossom. This recommendation is not in accordance with our views, after close and careful experiment. The ideas advanced by Mr. Hyde, in regard to the storage of hay, we can fully or nearly so concur in. These two items are nearly all the points that touch upon the subject now under consideration. The hay crop is undoubtedly the most important crop to the farmers of Massachusetts. "No hay, no cattle; no manure, no crop." It is an absolute necessity that our domestic animals should have some hay; some requiring more, some less. By consulting the statistics of Massachusetts for 1865, we find that the value of the hay crop for that year was about $13,195,274. If to this be added the value of grass grown upon our pastures, we find it will exceed all other agricultural products.

Nature has better adapted some of her soils to the growth of grass than others; still all our New England soil requires manure to insure a crop; and just in proportion as we furnish manure, in some form, will the soil send up her crops. No soil can long stand close cropping without some return. Again, we find by statistics that the domestic animals in this country are increasing at a much greater percentage than is the hay crop, showing conclusively that the farmer's highest interest and first study should be the increase of his hay crop, and the proper time of cutting and best method of curing the same.

We all agree, as we have intimated above, that to increase our hay crop, we must apply manure in some form, either incorporated by means of the plough or harrow into the soil, or by applying a dressing of finely composted manure to the surface; or in many other ways, some of which may be suggested as we pass along. The best time of cutting, and proper mode of curing and storing our hay crop, have not as yet been settled in the minds of our farmers. It is a law in nature, that cropping a plant at a certain time before it has arrived to a state of maturity, it more readily throws up a second growth and is more vigorous than if left until it has matured. The truth of this law every farmer has noticed. This is one reason urged for cutting grass early, for when cut early we secure at once a covering or hiding place for the young and tender grass roots; protecting them from the hot and scorching rays of an August and September sun. Also this covering, or if this second crop is cut and put into the barn, a third crop will soon start and form for these same roots a sufficient clothing to protect them from the frosts of winter. Experience has taught us how much more readily the grass will start in the spring, after its roots have been protected from heavy frosts by a good and sufficient covering, whether of top-dressing or even by its own aftermath, and that it will cut one fourth more hay at least than where no protection has been furnished.

Grass roots need protection from the rays of the sun, and frosts of winter, as much as man or beast. God made the beast of the field and covered him with sufficient clothing, according to his nature. A late-cut field will, of necessity, wear a brown coat the rest of the season, unless it is very rich, or quite wet. It will not produce, under any circumstances, as much or as good a quantity of grass as will the early-cut fields, and will not arrive to a state suitable to be cut the coming season as early. Hence by continuing to cut late, we reduce our fields rapidly, and get no return, and a less valuable crop of grass or hay. Again, it is very questionable whether the manure made from late-cut hay is as valuable as that made from the early cut, and if the object be to protect the roots, then the soil gets the advantage of the second crop much longer than if the grass had been cut late. It not only answers as a protection, but as a fertilizing stimulant and manure. Where a good second crop is secured and allowed to remain on the ground, once in three or four years scatter some clover seed in March, and it will catch and grow and make a very good quality of hay, especially if the land had been previously top-dressed. The clover roots growing deep, serve to keep the ground light and friable for the roots of the finer grasses. These clover roots decay, and make a deposit, in which is good food for the remaining grasses. Again, a small amount of manure used as a top-dressing on early-cut fields is worth and will produce much more than the same put on late-cut fields (always apply the dressing as soon after the crop is removed as possible). The heat and light of the sun are all-important, but the young plants and rootlets require protection from its direct rays at certain seasons. By applying certain chemicals, or in other words, by putting back just the same compound in quality and amount that the grass has taken out, we may continue to grow from year to year good crops of grass, if cut early. Experience and observation have demonstrated the fact to my mind, that the proper time to cut our English grass, without considering the effect upon the soil, and with reference to crop and quality (in the term English I do not include clover), is before the time the grass blossoms. At this time it contains the greatest amount of succulent matter. In converting grass into hay our object should be to cause as little change as possible, preserving as nearly as we can all the solid constituents in the same state as when the grass is young and green.

In grass cut at this state of growth, we have very little woody fibre in the stem. When the woody fibre begins to form, all the rich nutritive matter, such as starch, gum and a large amount of sugar, are carried by a certain process and stored almost entirely in the seed. At the time the seed has ripened the stem of most of our cultivated grasses has become a hard, dry substance like straw, and not much more fit for animal food. Clover has three sorts of heads or blossoms. At the time when the second blossoms are seen this crop is at its highest point of value; therefore this most valuable crop should be cut at this stage of its growth, and if cured properly is as valuable to the farmer as any of his grasses. One ton of herds-grass, red-top or clover, cut at the stage of its growth we have indicated, and cured in the manner which we shall indicate hereafter, will produce more milk or butter than the same weight of late-cut hay, and dried in the ordinary way, even when fed with a certain quantity of grain, fed daily to cows of equal milking capacity, and the same relative value will be found for making beef or feeding any farm stock ; and certainly the early cut is much more palatable, being more like green grass. It is also all-important, having cut our crop at the proper time, to cure it in such a manner that it will contain as nearly as possible, as we have indicated before, the same composition as when in a green state. It is difficult to say just how much time will be required to make hay, as it depends entirely upon circumstances ; but certainly we cannot cure it properly without the aid of the sun. And we all know that some days twenty minutes of sun will dry more than sixty minutes will at other times, although we are under a full sunshine.

Again, the wind has much to do with the drying process ; a north or east wind will not influence the drying of hay much, while a west or south-west wind hastens the drying process very rapidly. While grass remains green after it is cut rain injures it very little, as it has a coating of oily matter which renders it nearly water-proof. But if the rain continues several days and the hay is turned over several times, and becomes broken and bruised, then it is (chemists tell us) the sugar, gum and other soluble matter are liable to be washed out, and the bruised state of the plants admits at least of a partial solution of the various constituents, which induces fermentation, and during fermentation soluble albumen and sugar are destroyed, two of the most valuable elements of nutrition.

The old adage, make hay while the sun shines, is as true now as it was in the days of our fathers. We do not cut grass in wet weather if we can avoid it. The practice of carting hay into the barn the same day it is cut saves much anxiety about wet weather. To have the hay all nicely packed away in the barn every night, one can go to sleep and sleep quietly, and if perchance he is awakened by the sound of distant thunder or raindrops upon his window, he merely thinks to himself, what a fine thing a little rain will be just now to revive my pastures, and how beautifully green and rich the field I carted hay from yesterday will look in three days ; and again he goes off in sweet sleep and dreams of his hay crop all dry and secure from injury —a happy man *we know*. But on the contrary, imagine a farmer with six or eight tons to remain out over night—some in cock, some in winrow, some spread ; as he retires at eve he takes a lingering look at his hay, and a glance at the west, and with a heavy sigh he retires to rest. He will hear the most distant thunder or the first drop of rain upon his roof, and as he hears the drops begin to fall, his feelings can be better imagined than told, but an unhappy night we know. This is only a contrast of comfort, to say nothing of the gain or loss in either case.

I am convinced that in most parts of New England our English hay should be cut and stored, if the weather allow, before the seed has set; commencing to cut with the mowing machine as soon certainly as the dew is off, and one hand trimming around the walls, trees, &c. At eleven o'clock commence turning with forks or tedder, and lose no time until twelve M., when by this process it will become wilted. In this way we can begin, if the grass has been properly tedded, to cart into the barn as soon as one o'clock, always taking care to have help enough to finish carting as early as half-past four or five o'clock, after which the dew has fallen and renders hay unfit to be packed. By this process we allow from three to four hours for the out-door curing of our crop. We have in many instances packed hay in our barn, not having had more than two hours' sun, and it came out in spring perfectly sweet, and was relished by the cattle next to green grass, and certainly they must be considered good judges of such food. In this way of securing the hay crop, we avoid the danger of having much of it wet and also save in the process of storing it. We are always careful not to put hay into our barn that has any water in it, but never fear the sap if properly packed. When hay is taken from the cart or wagon it should not be rolled off, and then over and over on to the different parts of the mow, but it should be pitched on to the hay mow, and evenly distributed over the mow in even forkfuls, and each fork full packed and trodden upon. In this way the mow becomes solid and closely packed, which is absolutely necessary for the preservation of the hay, always remembering that the greener the hay is put in the closer it must be packed. In rainy weather let the hay be trodden upon by the men. Remember to keep the barn closed as much as possible afterwards.

Gentlemen of the Board—Farmers of Massachusetts—it seems to us that the subject of this essay more nearly interests the farmers of Massachusetts than any other agricultural question now before us. If you will investigate and experiment we know you will be convinced, and thereby much money may be saved annually to the farmers of Massachusetts alone. The question is often asked us, "Do you use salt on your hay?" We have experimented with salt on our mows and find that salt ruins hay when put in, in a green state. The salt separates or sets at liberty the water which is held in the succulent matter which would be otherwise retained. Therefore, by the use of salt we have a certain amount of water diffused all through our mows, and the consequence is the hay mats, moulds and smokes, and is unfit for feed. We have said nothing in regard to meadow or swale hay; we do not regard it very valuable for feed unless cut and mixed with a good allowance of meal.

More care is required in the curing process than with our English grasses. If put in the barn in a very green state it does not come out sweet and good; therefore we would *not* recommend putting meadow or swale hay into the barn with as little drying as we would our English grasses grown upon high land. JOHN JOHNSON, *for the Committee.*

FRAMINGHAM, January 27, 1871.

This essay led to a long discussion, when it was laid over under the rule.

Voted, That the officers of the Agricultural College be requested to institute a series of experiments with regard to the period of growth at which grass can be most profitably cut, and also a series of experiments by which the various processes of curing can be tested, and that a committee of three be appointed to confer with the college on this matter.

Messrs. Loring, Johnson and Ellsworth were appointed as this committee.

Adjourned.

FIFTH DAY.

The Board met at ten o'clock A. M., Mr. DAVIS in the chair.

Present—Messrs. Allis, Baker, Birnie, Boise, Brown, Bucklin, Clark, Davis, Ellsworth, Fearing, Hubbard, Hyde, Goodman, Johnson, Knowlton, Ladd, Loring, Moore, Saltonstall, Slade, Stone, Vincent and Ward.

Dr. Loring submitted a report as delegate to the Union Society.

The fact that it was in contemplation to lay out a road across the Agricultural College farm having been brought to the attention of the Board, it was—

Resolved, That in the opinion of the State Board of Agriculture it is not desirable that a highway should be run through the centre of the college farm, nor near the buildings on the farm, and that if a road has to be laid across any part of the farm it should be at a point most remote from the buildings.

The several reports of delegates and the various essays that had been submitted and laid over, were then read a second time by their titles and adopted.

Mr. Bradford, Chairman of the Committee on the Necrology of the Board, submitted the following:—

IN MEMORY OF JAMES THOMPSON.

All of the members of this Board have known and highly respected James Thompson, Esq., our late associate from Nantucket. The fact of his death has been feelingly announced to us by the Hon. Marshall P. Wilder, and we have passed appropriate resolutions to be entered upon our records, and the Committee on the Necrology of the Board desire now to present a brief tribute to his memory.

The appointment of this Committee met his hearty approval at the last annual meeting. But he hardly realized that his name would be the first enrolled upon our record since its formation, as having "passed to that bourne from whence no traveller returns,"—but such is life; we are here to-day in health; to-morrow we are gone, and in the language of inspiration, "the mourners go about the streets."

James Thompson was born on the island of Nantucket, August 10, 1819. He was the youngest of three brothers, sons of James Thompson and Diana (Gibbs) Thompson. They were respectable farmers, of good Puritan stock, and came to the island from Plymouth County. They gave their children the usual common school privileges of the times. The subject of this sketch died at "Elm Dale Farm," near Worcester, October 12, 1870, aged fifty-one years.

Mr. Thompson was elected to this Board in 1863 by the Nantucket Agricultural Society, and was the efficient president of that society at the time of his decease and for nearly ten years previous. He had been known as one of its leading members; always among its principal contributors.

It was truly a sad day to that society, when he and his family bade them farewell, and removed last April with his fine herds to Worcester County.

Mr. Thompson was a member of the Massachusetts House of Representatives from Nantucket in 1861, but the political arena had no charm for him. Often would he say, the good points of Jersey stock had more attractions than the caucus. He was selectman of his native town seven years, and a faithful servant too. In this Board he was a valued member, and we remember him as constant at his post of duty, a ready debater, a courteous, high-minded gentleman, entering into the discussions with great enthusiasm, exhibiting good culture, honesty of purpose and persistent effort in the cause of agriculture, to which he was ardently devoted.

Of honored Puritan extraction, his character and bearing were dignified and transparent, and if not a great man in the ordinary sense, he was better—a practical man.

He remained in the paternal home and on the farm until his father's death, and then bound himself to learn the trade of a carpenter, which business he successfully pursued until the year 1860. Afterwards commenced the manufacture of woollen hosiery and mittens, in connection with the dry goods business, and with these interests on his hands carried on farming, making a specialty of rearing Jersey stock. His stock soon outgrew his room, and he removed to "Elm Dale Farm." This place in colonial times belonged to Governor John Hancock, and his deed, now extant, shows the value of farming lands in that early period in Worcester County, for it was sold for *one shilling per acre*.

His last illness, of about six weeks, was attended with much pain and suffering, but he bore all with submission, giving directions from time to time as to the business of the farm and household, with strong faith in God, through the blessed Redeemer, and thus he passed away to be forever at rest.

Just six months after the time he left Nantucket, Jacob-like driving his cattle before him to his new home, the stricken family brought all that remained of the honored and beloved husband and father, agreeably to his dying request, back to his native island home, and the moaning winds of the stormy Atlantic shall sing his requiem until time shall be no longer.

In concluding this tribute we give an extract from the "Massachusetts Ploughman," written by a personal friend who visited "Elm Dale Farm" after his decease:—

"To this spot he had given, along with an estimable wife of similar tastes, his best thoughts and care. Here he hoped to establish his chosen home and rear his happy family. He had retouched a dwelling that bespoke in every feature the dignity of the ancient family living. He had his meadows, his arable lands, his pastures, his orchards and his woodland snugly about his homestead. A noble lawn stretching before his windows, on all sides he saw his fine blood horses and his pure Jerseys peacefully grazing. His home was becoming the paradise on earth he had designed it, and quiet prosperity and perfect contentment reigned around him. But death interrupted the beautiful plan, and all was instantly changed. Such a man, an agriculturist with the healthy and enduring enthusiasm, cannot drop out of human sight without exciting our profoundest regrets. His bereaved and worthy family will receive the sincere sympathy of all." LEWIS H. BRADFORD.

The Board then adjourned *sine die.*

Further time having been allowed the Committee on Fruits, the following was submitted by the Chairman, Col. WILDER, as the

REPORT ON THE CULTURE AND PRESERVATION OF FRUITS.

In submitting this report the Committee would remark that they desire to confirm and perpetuate the principles and practice recommended in their report of last year. These may be briefly stated as follows: The necessity of perfect drainage and the proper preparation of the soil. The regular application of manure to fruit trees as to other crops. The importance of clean culture without injury to the roots of trees by deep ploughing or spading. The early and proper thinning of fruit, and lastly, that constant care and vigilance are the conditions of success.

The year 1870 has been in some respects the most remarkable on record, and it may be profitable to note some of the obvious results of such a season on certain fruits. The heat and drought of the last summer were unusually severe; but notwithstanding this, the crop was abundant throughout New England. The fruit, although perhaps not so large as usual, was never smoother, handsomer or of better quality. This remark will apply especially to pears, for even the Beurre Diel, Flemish Beauty and some other varieties, which almost always crack and blast, were perfectly fair and free from imperfections, the old St. Michael or White Doyenne in many instances bearing fair fruit. All the varieties of out-door grapes ripened perfectly without spot or mildew. Some of the varieties of grapes, which seldom ripen in this latitude, came to maturity, and there was neither mildew on the foliage or rot on the fruit, and although the size of the clusters and berries was not of extraordinary size, it was never more excellent in other respects.

From these facts may we not draw the conclusion that mildew on the foliage, the cracking and blasting of fruits in former years, was the result of too much moisture, either in the air or the earth, or perhaps both; and do not these facts go to confirm our theory in favor of the thorough drainage of lands used for fruit culture? What the effect of such an extraordinary season may be on fruit-trees, time only can determine.

In regard to the small fruits, we advise that more attention be given to their cultivation, especially the strawberry and currant. Of the necessity of an increased supply, we need only to refer to the able report of our associate member, Mr. Slade, in 1868–69, in which he states "that while the market increased in population in seven years about forty per cent., the increase in consumption of strawberries was over two hundred and fifty per cent.," or in 1861 one box would supply a family of seven persons, and in 1868 the same family required three and a half boxes.

With reference to the currant, it may be proper to observe that the demand is constantly increasing, both for home use and for shipment. True, the worm is a serious drawback on its cultivation, but an early application of powdered white hellebore, when the dew is on, will readily exterminate the pest.

Fruit has become almost a daily condiment of many families. We know of some where fruit constitutes more than half of their subsistence during the warm months, and that in these families neither fever nor dysentery has appeared for nearly thirty years, and in fact scarcely any other disease, and there is no doubt whatever that where fruit is most regularly used, as food, there health most abounds. This opinion having become more established in the public mind, the demand for fruits will continue to increase, especially for the strawberry, currant and other small fruits which ripen in the summer months, when the constitution requires their cooling, acidulous influence. Our market now is largely supplied by strawberries brought from other States, but we doubt not that, by judicious management, this fruit can be made a highly remunerative crop in Massachusetts; instances of which are not now unfrequent, as is shown by its extended cultivation by our friend Captain Moore and others at Concord.

There still exists some difference of opinion in regard to the best methods of cultivation; but good results have been obtained both with culture in hills and in beds, the opinion however strongly prevailing that hermaphrodite varieties produce best in hills. By the latter method weeds may be kept down with the hoe at much less expense than by hand-weeding of beds.

In regard to the preservation of fruits we have but little to add to our report of 1869–70, and the opinions expressed by the chairman of this committee in his lecture before the Board at Pittsfield in 1869, page 95 of the Secretary's report. While the patent fruit-houses are of undoubted benefit where carefully watched and controlled, especially in preserving for a limited time early fruits, when the market is glutted with a superabundance of autumn pears, yet we cannot but fear that the expense, constant care and superintendence necessary for success of these houses, will prevent their general use.

Fruit-houses constructed with greater simplicity and cheapness are necessary for general use, and our fruit-growers must rely upon their rooms and cellars to be constructed by themselves. Fruits are of a perishable character, and require constant care and watching; but there are many cellars where they can be kept to good advantage if the necessary conditions for their preservation are observed. We have seen fruit rooms in a dry cellar with northern exposure, where fruits have kept admirably through the winter, where Duchesse d'Angouleme and Beurré d'Anjou pears have kept fresh to January, and early winter apples equally well to April or May.

In conclusion, we therefore would repeat and enforce the necessity of adhering to the following rules as indispensable to success for the perfect preservation of fruits, viz., sound and perfect fruit, cool pure atmosphere and exclusion of light, control of temperature and moisture, constant and careful supervision.

MARSHALL P. WILDER,
J. F. C. HYDE,
ASA CLEMENT,
WM. KNOWLTON,
Committee.

The following is the paper submitted to and accepted by the Board, as the

FIRST REPORT ON THE INJURIOUS AND BENEFICIAL INSECTS OF THE STATE OF MASSACHUSETTS.

BY A. S. PACKARD, JR., M. D.,
Entomologist to the State Board of Agriculture.

IMPORTANCE TO AGRICULTURISTS OF A KNOWLEDGE OF INSECTS.

In presenting my first annual report on the insects of our State injurious to vegetation, or in any way affecting human interests, it may not be out of place to state some facts, showing the importance to farmers of a knowledge of the habits and appearance of the insects with which they have to contend in their farming and gardening operations.

In the first place, however, we must not forget the good done by insects. They undoubtedly tend by their attacks to prevent an undue growth of vegetation. The pruning done to a tree or herb by certain insects undoubtedly causes a more healthy growth of the branches and leaves, and ultimately a greater production of fruit. Again, as pollen-bearers, insects are a most powerful agency in nature. It is undoubtedly the fact that the presence of bees in orchards increases the fruit crop, and the thousands of moths, wild bees and other insects, that seem to live without purpose, are really, though few realize it, among the best friends and allies of man.

Moreover, insects are of great use as scavengers, such as the young or maggots of the house fly, the mosquitoes, and numerous other forms, that seem created only to vex us when in the winged state. Still a larger proportion of insects are directly beneficial from their habit of attacking injurious species, such as the ichneumons, or parasitic hymenoptera, and certain parasitic flies, allied to the house fly, and many carnivorous species (wasps, beetles and flies, dragon flies and Aphis lions, etc.) that live upon other insects.

But few, however, suspect how enormous are the losses to crops in this country entailed by the attacks of the injurious species. In Europe, the subject of applied entomology has always attracted a great deal of attention. Most sumptuous works, elegant quartos prepared by naturalists known the world over, and published at government expense, together with smaller treatises, have frequently appeared; while the subject is taught in the numerous agricultural colleges and schools, especially of Germany.

In the densely populated countries of Europe, the losses occasioned by injurious insects are most severely felt, though from many causes, such as the greater abundance of their insect parasites, and the far greater care taken by the people to exterminate their insect enemies, they have not proved so destructive as in our own land.

In this connection I might quote from one of Dr. Asa Fitch's reports on the noxious insects of New York, where he says: "I find that in our wheat-fields here, the midge formed 59 per cent. of all the insects on this grain the past summer; whilst in France, the preceding summer, only 7 per cent. of the insects on wheat were of this species. In France, the parasitic destroyers amounted to 85 per cent.; while in this country our parasites form only 10 per cent."

As the writer has already remarked in the current volume of the American Naturalist, "a true knowledge of practical entomology may well be said to be in its infancy, when, as is well known to agriculturists, the cultivation of wheat has almost been given up in New England, New York, Pennsylvania, Ohio and Virginia, from the attacks of the wheat midge, Hessian fly, joint

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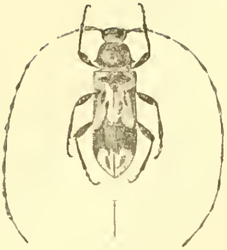
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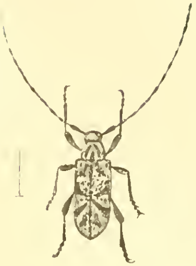
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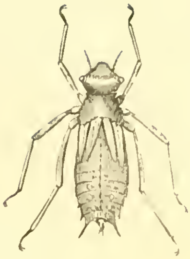
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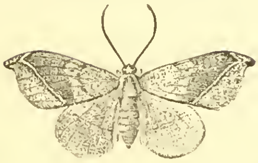
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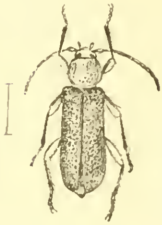
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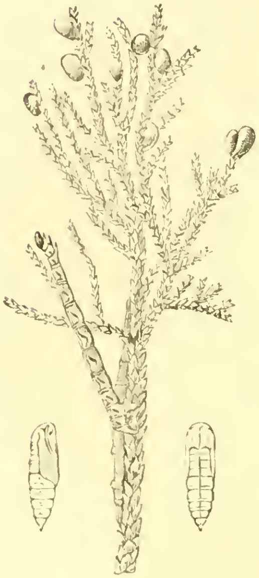
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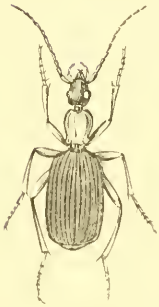
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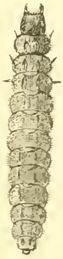
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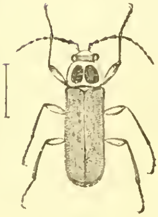
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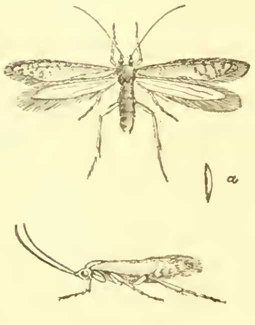

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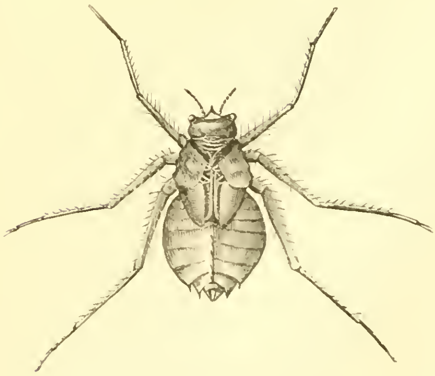
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worm, and chinch bug." According to Dr. Shimer's estimate, says Mr. Riley, which may be considered a reasonable one, "in the year 1864 three-fourths of the wheat, and one-half of the corn crop were destroyed by the chinch bug throughout many extensive districts, comprising almost the entire North-West. At the annual rate of interest, according to the United States Census, in the State of Illinois, the wheat crop ought to have been about thirty millions of bushels, and the corn crop about one hundred and thirty-eight million bushels. Putting the cash value of wheat at $1.25, and that of corn at 50 cents, the cash value of the corn and wheat destroyed by this insignificant little bug, no bigger than a grain of rice, in one single State and one single year, will therefore, according to the above figures, foot up to the astounding total of OVER SEVENTY-THREE MILLIONS OF DOLLARS!"

The imported cabbage butterfly (*Pieris rapæ*), recently introduced from Europe, is estimated by the Abbé Provancher, a Canadian entomologist, to annually destroy two hundred and forty thousand dollars' worth of cabbages around Quebec. The Hessian fly, according to Dr. Fitch, destroyed fifteen million dollars' worth of wheat in New York State in one year (1854). The army worm of the North (*Leucania unipuncta*), which was so abundant in 1861, from New England to Kansas, was reported to have done damage that year in Eastern Massachusetts exceeding a half million of dollars. The joint worm (*Isosoma hordei*) alone sometimes cuts off whole fields of grain in Virginia and northward. The Colorado potato beetle is steadily moving eastward, now ravaging the fields in Indiana and Ohio, and only the forethought and ingenuity in devising means of checking its attacks, resulting from a thorough study of its habits, will deliver our wasted fields from its direful assaults.

These are the injuries done by the more abundant kinds of insects injurious to crops. We should not forget that each fruit or shade tree, garden shrub, or vegetable, has a host of insects peculiar to it, and which, year after year, renew their attacks. I could enumerate upwards of fifty species of insects which prey upon cereals and grass, and as many which infest our field crops. Some thirty well known species ravage our garden vegetables. There are nearly fifty species which attack the grape-vine, and their number is rapidly increasing. About seventy-five species make their annual onset upon the apple-tree, and nearly an equal number may be found upon the plum, pear, peach and cherry. Among our shade trees, over fifty species infest the oak; twenty-five the elm; seventy-five the walnut, and over one hundred species of insects prey upon the pine.

Indeed, we may reasonably calculate the annual loss in our country alone from noxious animals, and the lower forms of plants, such as rust, smut and mildew, as (at a low estimate) not far from five hundred million dollars annually. Of this amount, at least one-tenth, or fifty million dollars, could probably be saved by human exertions.

To save a portion of this annual loss of food stuffs, fruits and lumber, should be the first object of farmers and gardeners. When this saving is made, farming will become a profitable and comparatively safe profession. While a few are well informed as to the losses sustained by injurious insects, and use means to ward off their attacks, their efforts are constantly foiled by the negligence of their neighbors. As illustrated so well by the history of the incursions of the army worm and canker worm, it is only by a combination between farmers and orchardists that these and other pests can be kept under. The matter can be best reached by legislation. We have fish and game laws; why should we not have an insect law? Why should we not frame a law providing that farmers, and all owning a garden or orchard, should co-operate in taking preventative measures against injurious insects, such as early or late planting of cereals, to avert the attacks of the wheat midge and Hessian fly; the burning of stubble in the autumn and spring to destroy the joint worm; the combined use of proper remedies against the canker worm, the various cut worms, and other noxious caterpillars? A law carried out by a proper State entomological constabulary, if it may be so designated, would compel the idle and shiftless to clear their farms and gardens of noxious animals.

In the succeeding pages will be noticed a few insects which have lately attracted attention as new to the State, and several others, not yet common, but with which it is desirable to become acquainted. A few beneficial insects are described as types of an immense number, which prey on noxious caterpillars and other insects.

INSECTS AFFECTING THE CURRANT.

The Imported Currant Saw Fly.—As there is no account of this destructive insect to be found in any very accessible source, the following notice is prepared. The writer is indebted partly to Western naturalists for information regarding its habits, as it is a comparatively new insect to this State.

It was imported from Europe into nurseries at Rochester, New York, during the year 1860. It seems since that time to have spread westward and eastward, arriving in Eastern Massachusetts about 1865, as I am informed by Mr. F. G. Sanborn. For two seasons past it has been very destructive in gardens in Essex County.

The parent of this worm is a saw fly, so named from bearing a saw-like sting, or ovipositor, with which it pierces the leaves or stalks of plants, cutting a gash, in which it deposits an egg, the egg passing out from the ovary through the oviduct, and thence through the blades of the ovipositor into the wound made in the plant. While most of the members of this family cut a gash in the leaf, into which an egg is pushed, a few, as in the present insect, simply place them on the under surface of the leaf, as seen in Fig. 1. (1) The fly has four wings, and belongs to the same group of insects (Hymenoptera) that comprises the bee, wasp, and ichneumon fly.

The following account of its habits is taken from the writer's Guide to the Study of Insects: "There are about fifty species of Nematus in this country, of which the most injurious one, the Gooseberry saw fly, has been brought from Europe. Professor Winchell, who has studied this insect in Ann Arbor, Mich., where it has been very destructive, observed the female on the 16th of June, while depositing her cylindrical, whitish and transparent eggs in regular rows along the under side of the veins of the leaves, at the rate of about one in forty-five seconds. The embryo escapes from the egg in four days.

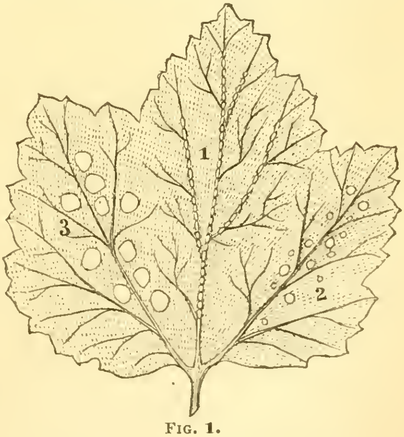


FIG. 1.

It feeds, moults and burrows into the ground within a period of eight days. It remains thirteen days in the ground, being most of the time in the pupa state, while the fly lives nine days. The first brood of worms appeared May 21st; the second brood June 25th." Fig. 1 shows the eggs deposited along the under side of the mid-ribs of the leaf; 2, the holes bored by the very young larvæ; and 3, those eaten by the larger worms.

Fig. 2, (*a*, enlarged) represents the worm when fully grown.

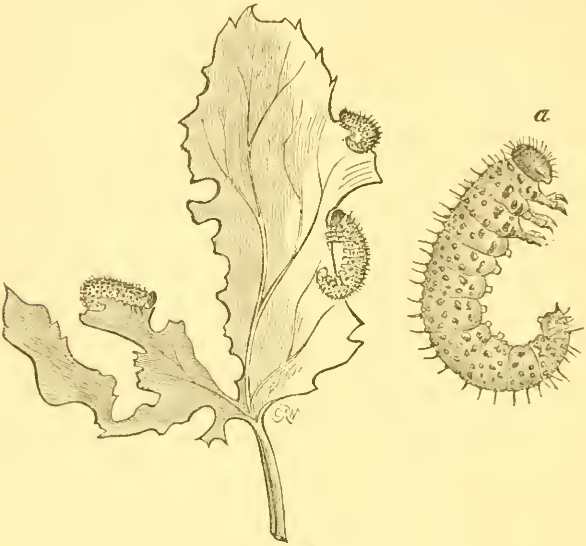


FIG. 2.

It is then cylindrical, pale green, with a pale green head, with the segment next behind the head, and the third segment from the end of the body, together with the last or anal segment yellow; the 16 false or abdominal legs are also yellow; the six thoracic legs are horn-colored. The body is transversely wrinkled, especially on the back, and is slightly hairy. The eyes are black, and the jaws (mandibles) are black, and on the inner side of the edge reddish. It is about three-quarters of an inch in length.

Previous to the last moult, however, and before it has gained its full size, preparatory to passing into the adult or winged condition, the body is covered with black tubercles; from each of which arises a stiff black hair. There is also a supra-anal, or dorsal black patch on the last segment of the body, from which arises a pair of black spines. On the back of the false caterpillar the tubercles become smooth and transversely oval, and arranged in two regular rows. Moreover, a still more important characteristic of the worm in this stage is the jet-black head, which in the fully grown insect is pale pea-green.

In Salem, my attention was drawn to the ravages of this worm by Dr. William Mack, who found them feeding on the currants in his garden June 8th. At this time they were spinning their cocoons, which were of silk, tough, dense, like parchment, and at first green, then becoming blackish, and covered with particles of dirt, and attached to the leaves in the breeding box. Out of doors they may be found the first week in June, and again during the first week in July among the leaves and stalks on the bushes, or among the leaves lying on the ground, or perhaps more frequently a little under the surface of the ground. Here they remain between two and three weeks in June, the adult flies (in Salem) appearing June 25th. At nearly the same date (June 29th) the worms of the second brood were spinning their cocoons. These cocoons (belonging to the second brood) remain under ground or on the leaves about the roots through the winter, the flies appearing in the spring and laying their eggs as soon as the leaves unfold.

Not having specimens of both sexes of this saw fly at hand I compile the following description (often using their own words) from Messrs. Walsh and Riley's account in the American Entomologist, Vol. 2, p. 16, from which these illustrations (Figs. 3 *a* and 3 *b*) are taken.

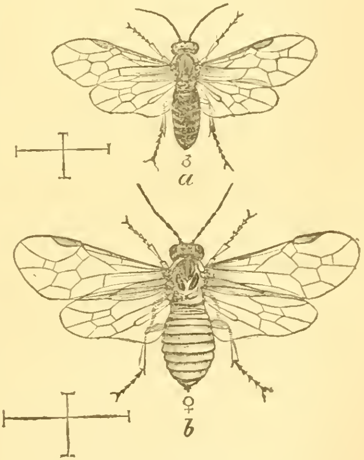


FIG. 3.

The female (Fig. 3 *b*) is a quarter of an inch long ($\frac{22}{100}$–$\frac{28}{100}$ inch), and is of a bright honey-yellow color. The head is black, with all the parts between and below the origin of the antennæ, except the tip of the mandibles (jaws) dull honey-yellow. The antennæ are brown-black, often tinged with reddish above, except towards the base, and beneath entirely dull reddish, except the two basal joints. They are four-fifths as long as the body; the third joint, when viewed sideways, is four times as long as wide; the third, fourth and fifth joints are equal in length, the remaining joints slowly diminishing in length. On the thorax are four conspicuous black spots, and other smaller ones. The legs are bright honey-yellow; the basal or hip joints (coxæ and trochanters) whitish, while the extreme tips of the hind shanks (tibiæ) and the whole of the hind toe-joints (tarsi) are blackish brown. The wings are glossy, with dark veins, and expand a little over half an inch.

The male (Fig. 3 *a*) is rather smaller ($\frac{20}{100}$ inch in length), and is black. The head is dull honey-yellow. The antennæ are brown-black, often a little reddish beneath, except towards the base; they are as long as the body, and while longer than in the female are also somewhat flattened out. The thorax has the wing-scales and the prothorax, or collar, honey-yellow. The under side and tip of the abdomen are honey-yellow.

The injury done to currant bushes during the past year was very great. In June we saw them in great numbers in a garden at Lawrence, where they had stripped the bushes, eating the leaves down to the leaf-stalk, myriads clustering upon the branches. The birds evidently do not feed upon them, and thus in dealing with this insect we are deprived of one of the most powerful agencies in nature for restraining a superabundance of insect life.

As this is an important and practical subject, let us digress for a moment, to notice some facts brought out by Mr. J. J. Weir, of the London Entomological Society, on the insects that seem distasteful to birds. He finds by caging up birds whose food is of a mixed character (purely insect-eating birds could not be kept alive in confinement), that all hairy caterpillars were uniformly uneaten. Such caterpillars are the "yellow bears" Arctia and Spilosoma), the salt-marsh caterpillars (*Leucarctia acræa*) and the caterpillar of the Vaporer moth (Orgyia), and the spring larvæ of butterflies; with these may perhaps be classed the European currant saw fly. He was disposed to consider that the "flavor of all these caterpillars is nauseous, and not that the mechanical troublesomeness of the hairs prevents their being eaten. Larvæ which spin webs, and are gregarious, are eaten by birds, but not with avidity; they appear very much to dislike the web sticking to their beaks, and those completely concealed in the web are left unmolested. When branches covered with the web of *Hyponomenta evonymella* (a little moth of the Tinea family) were introduced into the aviary, those larvæ only which ventured beyond the protection of the web were eaten." "Smooth-skinned, gaily-colored caterpillars (such as the currant Abraxas, or span worm), which never conceal themselves, but on the contrary appear to court observation" were not touched by the birds. He states, on the other hand, that "all caterpillars whose habits are nocturnal, and are dull-colored, with fleshy bodies and smooth skins, are eaten with the greatest avidity. Every species of green caterpillar is also much relished. All *Geometræ*, whose larvæ resemble twigs, as they stand out from the plant on their anal prolegs, are invariably eaten." Mr. A. G. Butler of London has also found that frogs and spiders will not eat the same larvæ rejected by birds, the frogs having an especial aversion to the currant span worms (Abraxas and Halia).

The natural enemies of the Currant saw fly are three kinds of ichneumon flies, of which one is a minute egg-parasite. Mr. Lintner of New York states that of fifty eggs laid by the parent saw fly, only four or five hatched out the currant worm. We see, then, that though the birds apparently destroy none, an immense number are carried off, even before they have a chance of doing any mischief, by minute insects of their own order.

One of the best remedies next to picking them off by hand, and which is really the most practicable method of getting rid of them, is to dust powdered white hellebore over the bushes, by sprinkling it from a muslin bag tied to a stick, as it otherwise excites violent sneezing. Used in this small quantity it is not poisonous. This is the remedy used with most success in the West, and recommended by Messrs. Walsh and Riley. Dr. W. Mack of Salem tells me that he has used a solution, consisting of a pound of copperas to six gallons of water, with much success. It blackens the leaves, but does not injure them permanently.

Dr. E. Worcester, of Waltham, according to the Boston Journal of Chemistry, finds that this worm "may be fully and almost immediately destroyed by the use of carbolate of lime. The doctor tried the powder in many instances during the past summer, and found that while it was fully as effective as hellebore, it was less disagreeable, less costly, and perfectly safe. The method of using it is to sprinkle it over the vines as soon as the worm makes its appearance, bringing it well in contact with the leaves, and soon the insect is destroyed. It will need but two or three applications, and the work is done."

This worm attacks the gooseberry as well as the currant, though in Massachusetts its ravages have been more confined to the latter shrub. As a preventative measure against its farther spread, in buying or transporting gooseberry and currant bushes, Walsh recommends that the roots be carefully cleaned of dirt, so that the cocoons may not be carried from one garden or nursery to another.

The Native Currant Saw Fly. As this species may be confounded with the European saw fly, though belonging to a different genus (*Pristiphora*), the following brief account of it is extracted from my Guide to the Study of Insects:—

This saw fly (Fig. 4 *a*, larva ; *b*, female, from the "American Entomologist" ; *P .grossulariæ* of Walsh) "is a widely diffused species in the Northern and Western States, and injures the currant and gooseberry. The female fly is shining black, while the head is dull yellow, and the legs are honey-yellow, with the tips of the six tarsi, and sometimes the extreme tips of the hinder tibiæ, and of the tarsal joints, pale dusky for a quarter of their length. The wings are partly hyaline, with black veins, a honey-yellow costa, and a dusky stigma, edged with honey-yellow. The male differs a little in having black coxæ. Mr. Walsh states that the larva is a pale grass-green worm, half an inch long, with a black head, which becomes green after the last moult, but with a lateral brown stripe meeting with the opposite one on the top of the head, where it is more or less confluent ; and a central brown-black spot on its face. It appears the last of June and early in July, and a second brood in August. They spin their cocoons on the bushes on which they feed, and the fly appears in two or three weeks, the specimens reared by him flying on the 26th of August." This worm may at once be distinguished from the

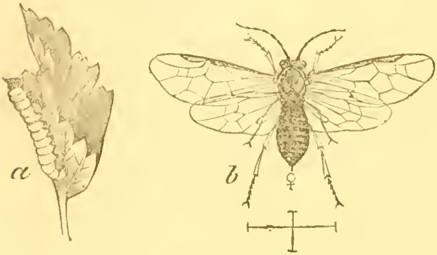


Fig. 4.

imported currant worm, by the absence of the minute black warts that cover the body of the latter. The same remedies should be used for this worm as are recommended for the preceding insect.

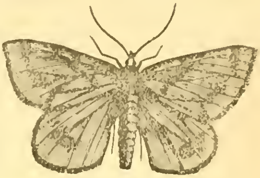


Fig. 5.

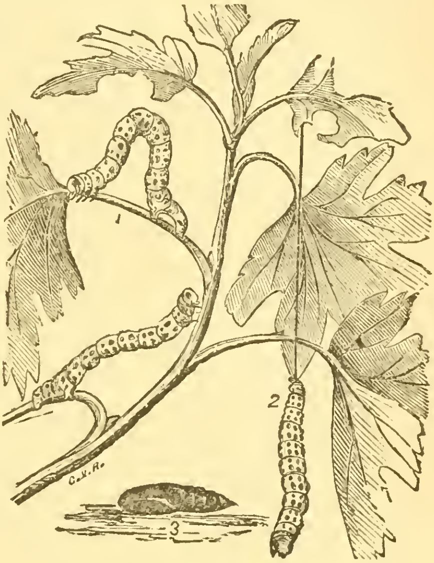


Fig. 6.

The Currant Span Worm. (Fig. 5, moth; Fig. 6, 1, 2, caterpillar, 3 pupa, from the "American Entomologist.") Many persons in speaking of the "currant worm" confound the caterpillar-like saw-fly larva with the well-known geometer caterpillar, which is a native species, and was long since described by Dr. Fitch, under the name of *Abraxas ribearia.* As soon as the leaves of the currant are fairly expanded, late in May or early in June, the young caterpillars, scarcely thicker than a horse-hair, may be found eating little holes in them. In about three weeks after hatching, it becomes fully grown, being about an inch long, and bright yellow in color, the body being covered with large black dots. The chrysalis is shining reddish brown, about half an inch long, and may be found late in June, either upon the ground or just under the surface. In two weeks after entering the chrysalis state the moth may be observed flying about the garden, or resting upon the leaves during cloudy weather. The moth is yellow ochreous, with dark, often nearly transparent blotches on the wings. It is not easily mistaken for any other moth. Mr. Riley, in an article on this insect in the "American Entomologist," states that by sprinkling powdered hellebore upon the leaves, or applying a solution of eight or twelve ounces to a bucketful of water, the caterpillars will be killed. Hand-picking assiduously followed up, and a vigorous shaking of the bushes over a sheet, or newspaper, repeated twice a day will keep this insect within moderate bounds.

INSECTS INJURIOUS TO THE APPLE.

The Apple Leiopus. (Plate 1, Fig. 1, *Leiopus facetus* Say.) This new borer in the limbs of the apple was found June 11th in all its stages of growth in the rotten limb of an apple-tree in Chelsea, by Mr. C. A. Walker. The grubs, or larvæ, were fully grown, and more numerous than the pupæ or adult beetles. How destructive it is, or what the habits of the grubs are must be ascertained by further observation. It is evident from the facts already known, that there is probably but one brood of beetles a year; that they fly about and lay their eggs in the bark of the tree late in June, and probably during July; and that the young larvæ bore in under the bark, and become fully grown in the autumn, spending the winter under the bark probably both in the larva and pupa states, the beetles appearing during midsummer.

The larva is rather long and slender, covered with fine hairs, and the end of the abdomen is rather blunt. The abdominal segments are very convex, and deeply separated by a wide suture. The thorax is about a third wider than the rest of the body. The three thoracic segments together are as long as they are wide. The prothoracic, or segment next the head, is somewhat lunate, and rather longer than the two surrounding segments; on the upper side is a slightly marked somewhat horny, square plate, but there is no thickening of the skin on the back of the succeeding segments, as usual in the larvæ of the family (Cerambycidæ) to which this borer belongs. It agrees in all respects with the larva of *Leiopus xanthoxyli* Shimer, except that the head is considerably smaller, including the under side and the mouth-parts, while the body is not so thick. In all other respects the description of the prickly ash borer (*L. xanthoxyli*) will agree with the present larva, for the larvæ of the two species, which differ very considerably in the beetle state, would be easily confounded. The same remedies may be used against this insect as against the well known striped apple-tree borer (*Saperda candida*).

The beetle itself is a slender, smooth-backed species with no ribs on the wing covers. It is pale ash gray, with a slight purplish tinge. The head and prothorax are blackish except on the hinder edge of the prothorax. The antennæ are yellowish brown, with the basal joint and articulations between the other joints dark brown. The wing covers are pale ash, with a purplish tinge, and an irregular rounded spot just behind the scutellum, united when the wings are folded with a similar spot on the other wing cover. The shoulder of each wing-cover is tipped with black, which extends backwards from a longitudinal large black spot extending backwards and connecting with a broad black band which crosses the terminal third of the wing, leaving the tip pale gray. The front edge of this band forms an acute angle in the middle of the wing; this band is sometimes partially wanting, and is then broken up posteriorly into a few black spots. In front of this broad band is an oblique row of short (longitudinal) lines, the first and innermost being shortest; the second one nearly three times as long and parallel to the costal spot. It is a little less than a quarter of an inch (.20) in length.

The Prickly Ash Borer (*Leiopus xanthoxyli* Shimer, Plate 1, Fig. 2). In this connection descriptions of the different stages of this species, which has only yet been found in Illinois by Dr. Shimer, to whom I am indebted for specimens, would seem necessary, inasmuch as they throw light on the structure of the apple Leiopus. According to Dr. Shimer it bores into the limbs of the prickly ash.

The larva (Fig. 7, *a*, larva; *b*, upper side; *c*, under side of the head) is very much like that of the preceding species. The head is a little more than half as wide as the prothoracic ring. The basal (occipito-epicranial) region is transversely oblong, the basal piece (occiput) being very short, and transversely almost linear, and separated by a well-marked suture from the middle portion (epicranium) of the head, the latter being nearly four times as broad as long, with the front edge straight: it is white, with the front edge pitchy black. The clypeus is smooth, trapezoidal in

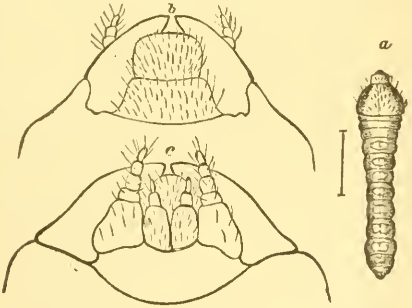


Fig. 7.

form, and three times as wide as long. The upper lip (labrum) is thin, hairy, transversely elliptical, a little less than one-half as long as broad. The basal chin piece (submentum) is a large transversely oblong area, with the front edge piceous, and very slightly hollowed, while the posterior edge is very deeply hollowed out. The chin (mentum) is nearly square, widening at the base, which is continuous with the base of the maxillæ, the whole posterior edge being well rounded. The labial palpi are three-jointed, the basal joints of each palpus being large, and no longer than broad, and touching each other; the second joint is much slenderer, and about half as thick as the basal joint; the third joint is not quite so long, and is scarcely half as thick as the second; its tip is acute and reaches out as far as the end of the second joint of the maxillary palpi. The maxillary palpi are four-jointed, very broad at the base; the first joint is scarcely half as long as broad; the third is a little longer than the second, while the fourth is much slenderer than the others, and about the length of the second joint. The mandibles are large and powerful, when closed not reaching as far as the end of the maxillary palpi; the ends are truncated, gouge-like. On the prothorax is a large, obscurely marked, squarish, very slightly horny (chitinous) area, scattered over with hairs, especially on the anterior edge. On the upper side of each segment of the body is a broad oval area, with a series of oval gatherings or folds, on each side of the transverse mesial main fold; those on the three rings succeeding the head (thoracic) are the same, but broader. There are no rudimentary thoracic legs. The end of the abdomen is blunt, well rounded, with the extreme tip forming a rounded portion. It is .35 of an inch in length.

The pupa is white, and in the single specimen observed was quite far advanced, the body being covered with hairs. The wings were quite free from the body, and the antennæ curved around outside the wing-covers, their tips meeting at the base of the head. The first and second pairs of legs are folded at right angles to the body, the third pair being oblique to the body. The tips of the first pair of tarsi reach to the base of the second pair of tarsi; the tips of the second pair of tarsi do not reach to the base of the third pair of tarsi, the third tarsi not reaching to the tip of the abdomen by a distance equal to nearly their length. The prothorax is full and convex, the hinder portion being larger in proportion to the rest of the body than in the adult beetle. It is a quarter of an inch in length. The beetle is characterized by four raised lines on each wing-cover, with five or six black dots on each line or rib. An oblique black line diverges from each side of the scutellum. Just in front of the middle is a triangular, pale space, bounded behind by an oblique, dark line. In color it resembles the bark of the ash; it is a quarter of an inch in length.

INSECTS INJURIOUS TO THE GRAPE.

The Grape Callidium.—(Plate 1, Fig. 3.) Several years ago I received from Dr. Shimer of Illinois, specimens of the larva, pupa and adult of this pretty insect (*Callidium amœnum* of Say), which is not uncommon in our own State. So much alike are all the borers of this family of long-horned beetles, that long and prolix descriptions and carefully drawn figures of the mouth parts (wherein most of the differences lie) are absolutely necessary for their identification.

The larva (Fig. 8, *b*, head seen from above; *c*, seen from beneath) has a small head, which is a little more than half as wide as the prothoracic segment. This latter, being the segment immediately succeeding the head, is half as long as broad, with a distinct median suture and four chitinous patches, the two middle ones transverse and irregularly oblong, being about twice as broad as long, the outer spots being longitudinal to the segment, and oblong in form, or about twice as long as broad. The three segments succeeding are of nearly equal length and width, being about half as long as the prothoracic segment, and not much narrower. The body decreases in width towards the posterior half, which is of equal width throughout, the end suddenly rounding off; the terminal three segments are indicated by very slightly marked sutures, and together form a straight cylindrical portion nearly as long as the three segments in advance of it taken collectively. The

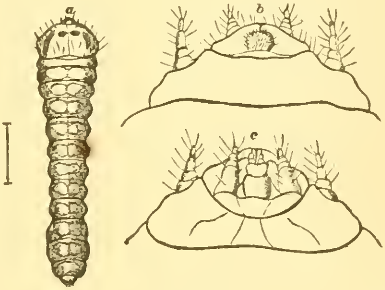


Fig. 8.

body is slightly hairy, with a few fine, pale hairs on the top of the segment next behind the head. The basal portion of the head (epicranium) is broad and smooth, with a few hairs on the edge. The eyes are two small black dots, each situated a little behind the base of the antennæ, and in a line with them. The frontal piece (clypeus) is very small, about three times as broad as long, while the minute upper lip (labrum) is two-thirds as long as broad; they together form a somewhat triangular portion resting on the inner edge of the mandibles, which are broad and short, the ends broad and square, and blackish in color. The antennæ are not quite so large or as long as the maxillary palpi; they are four-jointed; the first joint being thick, the third joint a third shorter than the third, while the fourth joint is filiform, and about as long as the second joint. The under side of the head is chitinous, with a mesial subtriangular fleshy area. The chin (mentum) is square, not much longer than broad. The under lip (labium) is one half as long as broad. The labial palpi are three-jointed, the basal joint being one-half as long as the second; the third joint is minute, short and hairy. The maxillary palpi are four-jointed, the first joint being twice as thick as the third, the second and third are of nearly equal length, while the fourth is slender and nearly as long as the second or third. The maxillary lobe is large and broad, reaching out to the labial palpi and as far as the end of the third joint of the maxillary palpi; there are a few hairs on the end of it.

On the upper side of the segments behind the prothoracic is a faint, transverse impressed line, with two or three short creases radiating from each end. On the eighth, ninth and tenth rings these creases become much longer and are parallel to the median line of the body, while the transverse crease disappears.

There are nine pairs of stigmata, one pair on the mesothorax, the remainder on the first eight abdominal segments. There are three pairs of rudimentary thoracic feet, represented by very minute two jointed tubercles, the basal joint consisting of a simple chitinous ring. The under side of the body is more hairy than above. On the under side of the prothoracic segment is a pair of round, smooth, very slightly chitinous spots, which are succeeded on each of the other rings by a pair of short, impressed oblique lines.

It is nearly half an inch (.45) in length.

It may be readily recognized by the four chitinous patches on the prothorax, and by the very minute clypeus and labrum. The upper side of the prothorax is inclined downward towards the head, but not so much as in Clytus.

The pupa is white, with the wing-covers reaching to the end of the second abdominal segment. The antennæ are not much curved, reaching to the end of the third abdominal segment, and resting above the legs. The prothorax is swollen just behind the middle, and is just as long as broad. The maxillary palpi are long, reaching nearly to the end of the coxæ. The labial palpi reach a little beyond the middle of the maxillary palpi. The two anterior pairs of legs are folded at right angles to the body, the third pair obliquely. The first pair of tarsi reach to the base of the second tarsi; the second pair of tarsi reach to the coxæ of the third pair of legs. It is a third of an inch (.33) in length.

The beetle itself has a reddish body, with Prussian-blue wing-covers. The prothorax is just as long as broad, with the sides moderately convex, and broadest just behind the middle. The antennæ and tibiæ are blackish brown, the tarsi being dull red, the hind pair being darker than the others, and the femora are reddish. The prothorax is distinctly punctured, while the elytra are very coarsely punctured. The scutellum is pale reddish. It is a quarter of an inch in length. The description of the beetle is taken from a single specimen received from Illinois.

INSECTS INJURIOUS TO FIELD CROPS.

The European Cabbage Butterfly.—We have two native kinds of white cabbage butterflies which have never done much harm to our cabbage and turnip crops. The first of these is the common white Northern cabbage butterfly, *Pieris oleracea* of Harris. Its habits are thus briefly described in the "Guide to the Study of Insects." "We have found the larvæ of this species on turnip leaves in the middle of August, at Chamberlain Farm in Northern Maine. They are of a dull green, and covered with dense hairs. When about to transform they suspend themselves by the tail and a transverse loop, and their chrysalids are angular at the sides and pointed at both ends (Harris). The butterfly is white with the wings dusky next the body, the tips of the fore wings are yellowish beneath, and the hind wings are straw-colored beneath. The yellowish, pear-shaped, longitudinally ribbed eggs, are laid three or four on a single leaf. In a week or ten days the larvæ are hatched. They live three weeks before becoming full-fed. The chrysalis state lasts from ten to twelve days. There is an early summer (May) brood and a late summer (July) brood of butterflies."

While this kind feeds on the leaves of the cabbage and turnip, the Southern cabbage butterfly (*Pieris Protodice*), while in the caterpillar state, feeds on the outer leaves of the cabbage plant. It is often destructive in market gardens in the Middle and Southern States.

The European Rape butterfly (*Pieris rapæ* Schrank) is, however, a much more formidable insect, as it is more abundant where it occurs, and the caterpillar feeds inside of the cabbage-head when forming.

It was introduced from Europe to Quebec about the year 1857, having been captured in 1859 by Mr. Bowles, of that city. It rapidly spread into New England along the different railroads leading in from Canada, and is now common about Boston and New York. During the past year it has done much damage in gardens in Monmouth County, New Jersey, as I am informed by Dr. S. Lockwood. About Quebec it annually destroys 250,000 dollars' worth of cabbages, according to the Abbé Provancher. It is evident that, in this newly arrived insect, we have another formidable pest added to our list of imported insects.

As I have not personally had an opportunity of studying this insect, the following account is taken from Curtis' Farm Insects. The male butterfly (Fig. 9) is white, with the tips of the fore wings black, dusted with white, while on the fore wings is a single, and in the female (Fig. 10) there are two large black spots, situated two-thirds of the distance from the base to the outer edge of the wing. It ex-

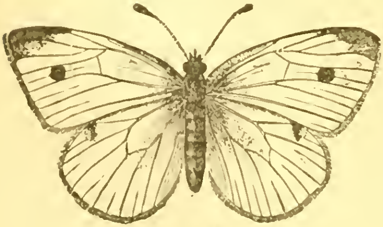


FIG. 9.

pands about two inches. The female lays her eggs singly on the under side of the leaves. The caterpillar (Fig. 11, *a*) is green, and so densely clothed with minute hairs as to be velvety; it has a yellowish stripe down the back, and another along each side, the belly being of a paler, brighter green; it is often more than an inch long, and about as thick as a large crow-quill. It changes in September under some board or stone, to a chrysalis, suspended by a thread spun over the back, as shown at fig. 11, *b*. It is of a pale flesh-brown color, freckled with black. It does not appear to have been very destructive in Europe, but, like other introduced species, it suddenly becomes a fearful scourge. The best remedies are evidently hand-picking when the caterpillars can be seen, and the capture of the butterflies by means of a light gauze net mounted on a wire ring a foot in diameter, and attached to a short pole. Affected cabbage heads should be carefully examined, and if much infested by worms, be burnt, for if they are suffered to lie about the garden after being pulled up, the caterpillars will attack the other plants.

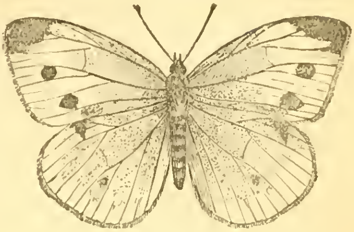


FIG. 10.

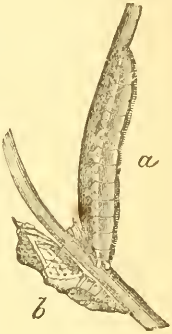


FIG. 11.

A correspondent of the "American Agriculturist" for November, 1870, states that "it is estimated that the loss from this insect will, in the vicinity of New York [city] alone, exceed half a million of dollars; and already the price of cabbages has advanced." He says that Mr. Quinn, the owner of a large plantation, "has found carbolic powder, superphosphate, and lime together, to destroy them. The carbolic powder appears to be sawdust impregnated with carbolic acid. Salt has been recommended, but Mr. Quinn did not find dry salt efficacious, though lime has been reported by others as useful."

Mr. C. S. Minot, in an interesting article entitled "Cabbage Butterflies," in the "American Entomologist," vol. 2 (from which Figs. 9, 10 and 11 are taken), strongly recommends destroying the chrysalis, which may be found under chips, boards, stones, &c., and advises that boards, raised two inches above the surface of the ground, be placed among the plants to attract the caterpillars when about to change to a chrysalis.

Mr. Curtis has described and figured several parasites of the three species of cabbage butterflies found in England, and he shows how thoroughly they keep in check these troublesome worms. Certain minute ichneumon flies (Chalcids) lay their eggs in those of the butterflies. Another chalcid fly (*Pteromalus brassicæ*) lays its eggs on the outside of the chrysalis of the white cabbage butterfly (*Pieris brassicæ*), and sometimes 200 or 300 of the little chalcid maggots have been found living riotously within a single chrysalis. They turn into minute brilliant flies, which multiply in excessive quantities. Mr. Curtis remarks that "some species of this extensive genus (Pteromalus), probably comprising nearly 1,000 species (!) swarm even in our houses, especially in the country, where in October and November I have seen immense numbers inside of the windows, and I believe that they hybernate behind the shutters, in the curtains, &c."

The Bean Weevil.—Since the article entitled "New and little known Injurious Insects" was printed in the last report of the Board of Agriculture, I sent specimens of the bean weevil, mentioned under the name of *Bruchus granarius*, to Dr. G. A. Horn, of Philadelphia, who pronounces it to be not the European *B. granarius*, but a native species (*B. varicornis* of Leconte). Mr. S. S. Rathvon, in the "American Entomologist" (Vol. 2, p. 118), states that Dr. Leconte, of Philadelphia, has had specimens of this species "raised from beans and cow-peas." Another common weevil is the *Bruchus obsoletus* of Say, a smaller species than the one mentioned above. It is blackish ash colored, and differs, according to Dr. Leconte, "in having the feet and the base and last joint of the antennæ black, whilst in *varicornis* they are testaceous (honey-yellow)."

INSECTS INJURIOUS TO SHADE AND FOREST TREES.

The Juniper Span Worm.—Many insects, either in the young or adult stages, or both, bear a wonderful resemblance to the plants, or portions of them, on which they feed, or disguise themselves in various ways to protect themselves from their insect or bird enemies. One of the most wonderful examples I have ever met with is the Juniper Span worm, (Plate 1, Fig. 4, and chrysalis, top and side views), which with difficulty can be distinguished from the twigs on which it lives. The caterpillar of this family (Phalænidæ, or Geometers) are well-known to resemble in color the leaves on which they feed, or the twigs among which they live, and some are ornamented with tubercles and other appendages, causing them to strikingly resemble the twigs on which they rest. Moreover, their habit, when at rest, of holding themselves out stiff and motionless, adds to the resemblance.

The caterpillar on the common juniper, was sent me from Norwich, Conn., by Mr. S. H. Scudder. The best description that could be given of it is to say that it would easily be mistaken for a portion of a twig of the tree on which it feeds. It is about an inch and a half long, and less than a line in thickness. Its body is rather rough, and with a few prominent tubercles in size and form resembling the scales left by the falling of the leaves of the juniper.

On the 17th of June it changed into a beautiful pea-green chrysalis, of the form indicated in Mr. Emerton's drawing. On the 29th of June the moth appeared, so that it lives about twelve days in the chrysalis state.

The moth proved to be an undescribed species, which may be called *Drepanodes juniperaria* (Plate 1, Fig. 5). It has unusually falcate fore wings. The ground color of the upper side of the wings is a pale fawn brown, with a rusty, but no purplish tinge, as in some other species of the genus ; but the body and antennæ are pale fawn brown. The fore wings at the base are fawn brown, but with rather thick-set black scales, especially towards the inner line. This line is curved zigzag, rusty fawn brown and is very distinct ; it begins at the basal third of the costa, and curving around opposite the discal dot, in a generally oblique direction, ends nearly as far from the base of the wing on the inner edge as on the costa ; below the median vein the line is acutely zigzag, forming a tooth just below the lowest median veinlet, followed by a curve inwards on the submedian vein. The discal dot is small, black, but distinct. Just beyond the dot, the wing inside of the outer line is rusty, becoming deeper in tone next the line. The outer line is straight, white, narrow but sharply defined, and forms an acute angle opposite the apex, being reflected back on the costa. The line is shaded externally with dense black scales, becoming thinner towards the outer edge of the wing. From the apex of the bend on the outer line starts a black streak, which is interrupted in the middle, but ends on the lower side of the hooked apex of the wing, which is unusually long and large. The fringe is rust colored, with the edge white. The outer edge of the wing is deeply hollowed out just below the apex, but below is full and convex. The hind wings are like the fore wings, but without the inner line. The discal dot is distinct, and the outer line is straight, ending just before reaching the costa. There is a broad costal white area. The legs and under side of the wings are fawn colored, densely speckled with black, giving it a peculiar silky, glossy appearance, suffused with a very slight wine-colored tint. The surface of both wings is uniform ; the discal dots are more diffuse than above, being more distinct on the hind wings. The outer line is white, distinct, broader than above, and bent at right angles on to the costa, but the line disappears before reaching the hind edge, which is whitish. The black stripe sent out from the angle of the line, and reappearing on the hinder edge of the apex of the wing, is much as above. On the hind wings the line is straight, broader than on the fore wings, and extends on to the costa. The body is half an inch (.50) in length, and a fore wing measures .65 of an inch in length.

This fine species more nearly resembles Grote's *D. aquosus* from West Virginia, but differs in the outer line, and by not being at all tinged with purple on the upper side of the wings. It will undoubtedly soon be found in this State, and its caterpillar should be looked for on the Juniper during the last of May and early in June.

The Cedar Tineid.—(Plate 1, Fig. 6, enlarged ; *a*, cocoon, nat. size.) This is a little moth, of which the caterpillar is unknown, though I found the moths and cocoons in abundance on a cedar tree in Brunswick, Maine, July 10th. It is undoubtedly similar in its habits to a little moth which lives not uncommonly on the apple-tree, and has been described by Dr. Clemens under the name of *Bucculatrix pomifoliella.* Its long, slender, white cocoons may be found, at any time after the leaves have fallen, on the branches of apple-trees.

Dr. Clemens says that " the larva feeds externally on the leaf of the apple, at least at the time it was taken, in the latter part of September. It is cylindrical and submoniliform; tapers anteriorly and posteriorly; with punctiform points and isolated hairs; first segment with rather abundant dorsal hairs; three pairs of thoracic feet and five abdominal pairs. Head small, ellipsoidal, brown; body dark yellowish green, tinged with reddish anteriorly; hairs blackish and short. Early in October the larva enters the pupa state, wearing an elongated, dirty white, ribbed cocoon, and appears as an imago during the latter part of the following April, or early in May." The present species seems to be undescribed, and may be called *Bucculatrix thuiella.* It belongs to the extensive Tineid family, and its general appearance is sufficiently indicated by the drawing. The body and wings are pearly white, and the antennæ are white, with brown wings, while there is a low broad tuft of white scales between the antennæ, the crest being much flatter than in the species living on the apple. The fore wings are white, and crossed in the middle by a broad brown band, and beyond this band by alternating white and brown stripes, crossing from the front edge (costa) of the wing. On the end of the wing, and in the middle of the outer edge, is a conspicuous black spot, like the eye in a peacock's feather. To describe the wing and its markings more fully,—the basal half of the wing is white, unspotted, except a short, transverse brown band, extending from the inner edge, not quite to the middle of the wing. On each side of this band is a row of two or three minute dots. The middle band is broadest on the hind edge. Beyond and arising from the costa, where they are broadest, and extending to the opposite side of the wing, are six brown lines, alternating with white interspaces. These lines run together in the middle of the wing, brown dots being added, but which end as distinct lines on the inner end of the wing. The three outermost lines are much curved, and, with the curve of the fringe, form a circular area, in the middle of which, on the base of the fringe, is the curvilinear, rather thick, dark brown spot. The long fringe on the end of the wing is white at base, and brown at the end. The hind wings are pale brown, acutely pointed, with a long silvery fringe. The tibiæ and tarsi of the fore legs are brownish, while the hind legs are white, with a long fringe on the hindermost tibiæ. The length of one fore wing is .18, and the length of the body is .13 inch.

The cocoon is white, tough, dense, slender cylindrical, and

.20 inch in length. It is fastened by one side to the leaf, and differs from that of the apple Bucculatrix in not being ribbed longitudinally. A minute, beautifully brilliant green ichneumon (Chalcis) fly seems to attack in considerable numbers the chrysalids of this insect, as nearly half of those reared by me turned out one of these parasites. It is a species of a genus allied to Eulophus, having the antennæ pectinated, the terminal joints throwing off five long branches. It differs, however, from Eulophus among other characters by having a short, thick body, a small, conical abdomen, and short, thick antennæ. The fore wings are broad, triangular.

The Two-lined Telephorus.—(Plate 1, Fig. 7, beetle; Fig. 8, larva. Fig. 12, *a*, top view of head and prothoracic segment; *at*, antennæ; *md*, mandibles; *b*, under side showing *mp* the maxillary palpi; *lp*, labial palpi; *f*, first pair of feet. The beetles of this and other species which belong to the family of fire-flies feed on the leaves of forest deciduous trees, especially the birch. The larvæ, however, devour snails and insects, and do no injury to vegetation. The larva of this species was identified by Mr. P. S. Sprague, who found it near Boston, under stones in spring, where it changes to a pupa, and early in May becomes a beetle, when it eats the newly expanded leaves of the birch.

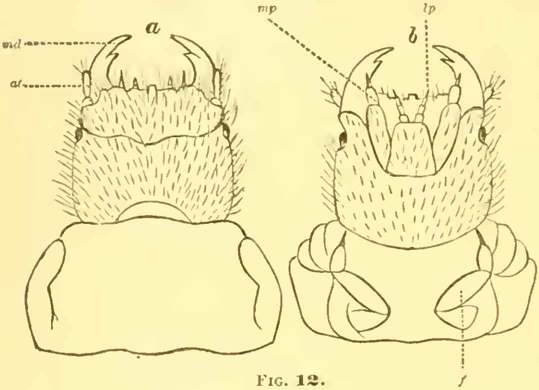


FIG. 12.

The body of the larva is rather long and slender, thickest in the middle, where it is about twice as wide as the head, and tapers slightly towards each end of the body, the terminal segment being a little less than half as thick as the middle segment. The segments of the body behind the head are unusually convex, the sutures between them being very deep. The body is covered with fine, dense hairs, giving it a peculiar velvety appearance. Its general color is horn brown, the head being darker. The head is remarkably flattened and square, being scarcely longer than broad, and densely covered with short hairs above and beneath. The antennæ are inserted on the side of the head, and immediately behind them on the side are the eyes; the occipital suture is situated midway between the base and the front edge of the head, forming a straight line just behind the eyes. The antennæ are two-jointed, and received into a large socket; the first joint is very short; the second joint four times as long as the first, a little slenderer, and increasing slightly in width towards the end, which is abrupt, and contains a minute, rudimentary third joint. The maxillæ are broad, subtriangular, projecting a third of their length beyond the labium, with the ends broad and square. The palpi extend out from the head as far as the antennæ, and are three-jointed, with the basal joint quite thick, rather longer than thick, while the second joint is very short, and one-half as long as thick; the third minute, rudimentary. The anterior edge of the occiput beneath is deeply hollowed out; the chin (mentum) is oblong, with very square edges, and is one-fourth longer than broad. The labial palpi are three-jointed, the basal joint very short, one-half as long as broad; second nearly twice as long as thick, third minute, rudimentary. The mandibles are large, stout, two-toothed, the inner tooth situated a considerable distance from the tip. The labrum is broad and perfectly square in front, with a median notch dividing the edge into two slight lobes. The clypeus is an illy defined oval, convex area.

Along the median line of the body is a slightly marked row of short, paler streaks, more continuous on the thoracic than the abdominal segments, forming on each of the latter segments an elongated spot situated on the anterior edge of each segment except the last. On each thoracic and the last abdominal segment is a pair of lateral oval brown spots, paler in the centre. Behind these on each abdominal segment (except the last) is a row of pale short lines, placed in the middle of the segment. Further down on each side is a similar row of short lines, which are, however, subdivided into two spots, which on the thoracic segments form a row of four or five pale dots. Between these two lines is a row of black dots, one on each segment. The legs are rather short, and quite hairy. The terminal segment of the abdomen is about as long as broad, and well rounded behind.

It is three-quarters (.75) of an inch in length. The pupa was not preserved. The beetle itself is soft-bodied, brownish black and reddish yellow. Its specific name (*bilineatus*) was given to it from the two short, broad, blackish bands on the prothorax, which is reddish yellow. The head is reddish yellow, with a broad black band between the eyes, and the antennæ are black. The body beneath is pale reddish, except the under side of the middle of the thorax (meso and meta-thorax). The legs are pale reddish at base, while the end of the femora and the tibiæ and tarsi are entirely black brown. It is about a third (.30) of an inch long.

BENEFICIAL INSECTS.

It is quite as essential for one to know what insects are beneficial to agriculture as what are injurious, and whenever any new facts relating to the habits and transformations of the former come to our knowledge, it will not be out of place to mention them in such a Report as this. Foremost among the beneficial kinds are the Tiger beetles (*Cicindelidæ*) and the ground or carniverous beetles (*Carabidæ*). A good example of the latter is the American Galerita (*G. Janus* Fabr., Pl. 1, fig. 9), which is especially common in the spring months under stones, where it undoubtedly feeds largely upon cut-worms and other noxious caterpillars and grubs which take refuge in the same places.

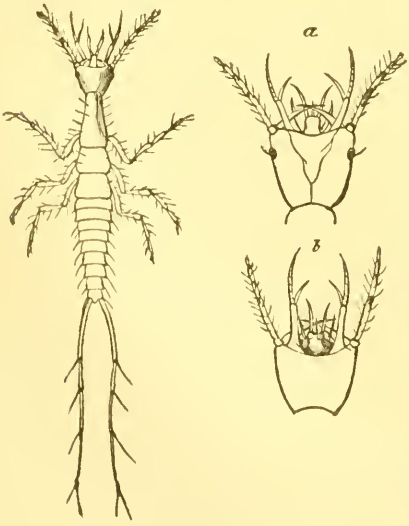


Fig. 13.

The beetle is rather large (the cut representing it slightly larger than the life size), with a blackish body and reddish antennæ, legs and prothorax. The wing covers are blackish blue, while the body beneath, with the exception of the prothorax, is blackish brown. It is three-quarters of an inch long.

The larva (Fig. 13, *a*, upper; *b*, under side of the head) is a most singular creature, and was discovered by Mr. J. H. Emerton of Salem, running under stones July 1, 1869. It is closely allied to the larva of *Galerita Lecontei* of the Southern States, a figure of which, with that of the pupa, is given in the "Guide to the Study of Insects" And though the beetle has not been directly reared from the young, there can be no doubt but that is the species to which we have referred it, as no other is found in the Northern States.

The body is long, slender, flattened, and of a dull, horny brown. The head is horny brown, but whitish on the sides and beneath; in form it is equilaterally triangular; hairy on the sides behind the eyes; one or two of the hairs on a side being nearly as long as the head itself. The eyes form two rounded black spots, each situated about one-third of the distance from the insertion of the antennæ to the base of the head. The clypeus is triangular, shield-like at the base, and reaching near to the base of the head. On the front edge, which is as broad as the clypeus is long, is a mesial bifid process nearly as long as the head, and dividing in the middle into two forks, each division being half the length of the entire process, and ending in a stout hair. The antennæ are long, slender, and four-jointed, the basal joint being equal in length to the bifid tubercle; second joint a little more than one-third as long as the basal; the third slightly longer than the second; fourth joint short, scarcely half as long as the third. From the third and fourth joints arise long, slender hairs, one or two of them being from one-half to two-thirds as long as the entire antenna. The maxillæ are long and slender, the basal joint curved, and as long as the under side of the head from the base to the end of the labium; from the basal joint arise two articulated divisions, the outer one four-jointed, the joints gradually increasing in length, the last obconic, acute. The inner division is nearly one-half shorter than the outer, and is two-jointed, the basal joint being rather thick, the second very slender, and a little longer than the first. The chin (mentum) is squarish, a little longer than broad, being slightly trapezoidal; the labium is somewhat trapezoidal in shape, about as long as broad, with an acute tooth between the base of the palpi. These last are two-jointed, the joints of equal length. The mandibles are very long, curved, sickle-shaped, as long as the head itself, with a large acute tooth just before the middle, projecting straight out; beyond this the mandible is much slenderer.

The prothorax is remarkably long, being a third longer than broad, and widest very near the hinder edge. The succeeding segment is trapezoidal in form, as wide as long, and the third segment is shorter than broad. The basal segment of the abdomen is very short, being three times as broad as long; the remaining segments gradually increase in length. From the ninth abdominal ring arises a pair of remarkably long, four-jointed, filamentary appendages as long as the whole body, except the head; the basal joint is as long as the succeeding ones, and the fourth is half as long as the basal joint. A single long fine hair arises from each joint, and three similar ones radiate from the end of the last joint. The two last joints and base of the first one are whitish, the remainder brown; the bases of the first joints are so dilated on the inside that they touch each other. Between the anal stylets is the tenth segment of the abdomen; it is one-half as wide as the next segment, and is a little longer than broad; and terminated by two short, conical, contiguous appendages, slightly separated at their base, however. The dorsal thickened plates extend far down the sides of each segment of the abdomen; below, is an oblong longitudinal brown plate. The legs are long, and whitish at the base; the hip joint (trochanter) about as long as the tibiæ; tarsi longer than the tibiæ. The hind legs are nearly as long as the thorax and abdomen together. The legs are covered thickly with stout hairs. The body is .38 of an inch long, and the stylets .32 in addition.

Dragon Flies.—These animals do great service, both in the larval state when they live in ponds, and in the adult winged stage, when they consume immense quantities of mosquitoes, gall flies, midges and other noxious and troublesome insects. In the young stages these insects live at bottom of ponds or quiet brooks, and have the form figured on plate 1, figs. 10, 11. Their habits and structure are interesting, as they are very carniverous and wily in their mode of attack. The labium, or under lip, covers the face like a mask, concealing their jaws. The pupa only differs from the larva in having rudiments of wings.

At a field meeting of the Essex Institute, held at Wakefield in June, 1869, Mr. F. W. Putnam, Director of the Peabody

Academy of Science, found the pupa (Pl. 1, fig. 10) of *Cordulia lateralis* Burm., and reared from it the dragon fly, which was kindly identified for me by Prof. Hagen, of the Museum of Comparative Zoölogy at Cambridge. This pupa may serve as a type of the larval form of this genus.

The body is broad and somewhat flat, the abdomen ending in two rather long spines. The head is somewhat triangular when seen from in front, and the eyes are rather large, though not so prominent as in the next species figured. The occipital region is rounded and smooth behind. The antennæ are seven-jointed, the two basal joints being thick, the remaining ones hair-like, and all of the same thickness. The space between the antennæ is smooth. The mask, or labium, is full and convex, reaching further up the front, and nearer the base of the antennæ, and the teeth along the edge are small, blunt, and do not interlock. The thorax is scarcely wider than long, and the rudimentary wings extend to the fourth abdominal segment. The abdomen is scarcely twice as long as broad ; along the back is a median row of compressed spine-like processes projecting backwards. It is of a pale horn color, with a row of round lighter spots on each side of the abdomen, while the legs are banded with paler, and on each side of the thorax is a dark stripe. It is .80 of an inch in length, and .28 inch broad.

With this may be compared the pupa of another dragon fly, *Didymops ?* (Pl. 1, fig. 11), in which the head is square above, and the eyes are very small and projecting, adding to the angular appearance of the head. On each side at the base of the occiput is a blunt tubercle, and between the antennæ is a large triangular tubercle which is thin and up-curved, reaching to the end of the second joint of the antennæ. The teeth of the labium are large, triangular and interlock. The wing covers are long, and the upper pair extend to the end of the fifth segment of the abdomen. The legs are long, the tarsal claws are scarcely curved, and are remarkably long and slender, being nearly half as long as the tarsus itself. The abdomen is much flattened, nearly as broad as long, with a median row of dorsal, short, compressed, hook-like tubercles. The eighth abdominal segment ends in a pair of short spines. The creature is of a dark horn color, and is an inch long and half an inch wide.

PEABODY ACADEMY OF SCIENCE, }
SALEM, Jan. 20, 1871. }

The annual returns or Transactions of the various agricultural societies for the past year are more complete, full and valuable than they have usually been, though still, as a general rule, far below the standard which societies enjoying the bounty of the Commonwealth ought to maintain. Practical statements in regard to the cultivation of crops, especially results of experiments carefully tried and accurately reported, have a peculiar value to every farmer who is proposing to cultivate and raise similar crops. But the difficulty with many of the statements which appear in the Transactions of the societies, is that they are not sufficiently definite. I have so often called attention to this defect, that it is a matter of regret to be compelled to allude to it again, and to urge it upon the notice of the secretaries of the societies, who have it in their power, in many cases at least, to remedy it.

Many of the Statements are necessarily omitted from the Abstract, or second part of this Report, simply because they fail in this most essential point, that of definiteness, which makes them utterly worthless as a guide to any farmer who should propose to himself to repeat the experiment. To speak of applying so many " loads " of manure to an acre of corn, without specifying what is meant by a load, conveys no clear idea of the amount to a farmer in a distant section of the State, and the publication of such a statement is of no use by way of instruction. I trust a mere allusion to this point will be sufficient to lead to improvement in this respect.

At the time of the preparation and presentation of the Report of the Cattle Commissioners, which appears in the early part of this volume, the disease known as the *Epizoötic aphtha*, or the " Foot and Mouth Disease," had but recently appeared in our midst, and little time had been devoted to the investigation of its character and symptoms. It was not publicly known to be the disease so very prevalent and so disastrous in Europe, till the meeting of the State Board of Agriculture at Framingham, about the middle of December, and then it was found to have come through Albany and Brighton market, and to have reached several large herds, and to be spreading like wildfire in various directions from Brighton as the great centre and focus. When it became known that we had a highly contagious disease to contend with, the commission was promptly filled, and active measures taken to prevent its further spread, and to confine it, as far as possible, to the points which it had already reached. The sale of milch cows and store cattle at the public markets was prohibited, a competent inspector appointed, and the officers of towns were required to isolate herds where the disease existed. General trade in cattle was suspended, and the rapid spread of the disease stopped. The virus or poison, which had infected the cattle yards of Albany and Brighton, remained latent while the ground was frozen in January and February; but cattle exposed in those yards after the ground opened from the frost, took the disease in the same acute form, and rendered the continuance of rigid sanitary measures imperatively necessary, making it probable also, that, notwithstanding the restrictions put upon trade by the cattle commissioners, the disease will linger among us for many months to come, if not permanently, to plague the owners of neat stock.

Meantime the Board of Health instituted a series of experiments and investigations, by which the highly contagious nature of the disease was proved beyond all question; and though a fatal termination is uncommon, the use of the milk of diseased cows has been followed not only "by lesions of the mouth and intestines, but also by a well-marked cutaneous eruption," causing more or less distress. "In one family, the members of which partook freely of milk from this source, a peculiar disease broke out in the course of five or six days, causing at the same time similar and well-marked symptoms in no less than three individuals, all adults. These symptoms consisted of loss of appetite, nausea, slight acceleration of the pulse, swelling of the tonsils and sub-maxillary glands, the appearance of a few vesicles upon the lips and tongue, and a singular cutaneous eruption on the lower extremities, consisting of clusters of papules, vesicles, pustules and ulcers of different sizes—the latter characterized by a dark red color, while their peripheral margin was slightly elevated and inflamed. These appearances, in varied stages of development, were all seen at one and the same time, indicating that a fresh outbreak of vesicles was taking place as rapidly as the old ones disappeared. In each instance the eruption was confined to one limb, in two instances appearing upon the front and side of the thigh, and in the other just below the knee, and although attended by no great constitutional disturbance, was, nevertheless, rather tedious in its progress, lasting six or seven weeks." This was a family in Brighton.

These facts, perfectly well authenticated, are sufficiently conclusive; but to test the specific nature of the eruptions caused in this way by drinking the milk of cows affected with the disease, the virus or lymph was taken on quills from the vesicles on one of the persons above mentioned and transferred to the bodies of two young rabbits. In two days the inner surface of the lips was swollen and covered with a bloody discharge. Small white specks soon appeared on the inflamed spots, and the animals were seized with convulsions and died, one in two, the other in four days after the inoculation.

On the 10th of February, 1871, portions of the same lymph, taken from one of the persons alluded to, were introduced, by the ordinary process of inoculation, into the arm of a healthy man, when in two days vesicles formed at two of the three points of inoculation. In four or five days more, these vesicles attained the size of a split-pea and were ruptured, and unhealthy looking ulcers appeared in their places, and these continued to enlarge. Twelve days after the inoculation these ulcers gave no indication of healthy action, thus leaving no doubt as to the contagiousness of the disease.

Though far less fatal than the well known pleuro-pneumonia, which was imported and disseminated among us a few years ago, yet, when complicated with other organic difficulties, it has been fatal to cattle; and we know of many losses by death, cases which have not, for various reasons, been reported to the public, but which prove the serious nature of the malady, and the importance of taking every possible and legitimate measure to eradicate it from our midst.

This, like pleuro-pneumonia, is an imported disease. It was brought into Canada from Europe a few months ago, and though the journals of Canada have strenuously denied that it has ever existed there, it is perfectly well known to have arrived there in the summer of 1870. The name of the owner and importer of the stock, the name of the vessel which brought the cattle and introduced the disease, even the number of the car by which the disease was first brought from Quebec to Compton, Canada East, are perfectly well known, so that there is no doubt, and can be none, in the mind of any intelligent man, that it is a foreign and imported disease.

It is evident that no amount of effort or expense to eradicate so troublesome a disease, and to prevent it from obtaining a permanent lodgment in our midst, should be regarded as too great a price to pay for exemption.

The experience we have had in the introduction of two serious and contagious foreign diseases, with the delays of necessary legislation and the immense losses and public disaster due to such delays, suggest the importance of appointing a competent State Inspector of Cattle, with an adequate salary, whose duty it shall be to visit all parts of the State, examine all cases of supposed contagion, and report the facts for the prompt information of the government. Had such an officer existed in 1859, he would have saved the Commonwealth enough to pay his salary for twenty years, and a vast amount of suffering and loss on the part of individuals besides. Had such an officer existed in 1870, he would have saved the community enough to have paid his salary for ten years at least, and probably much more, as the end is not yet.

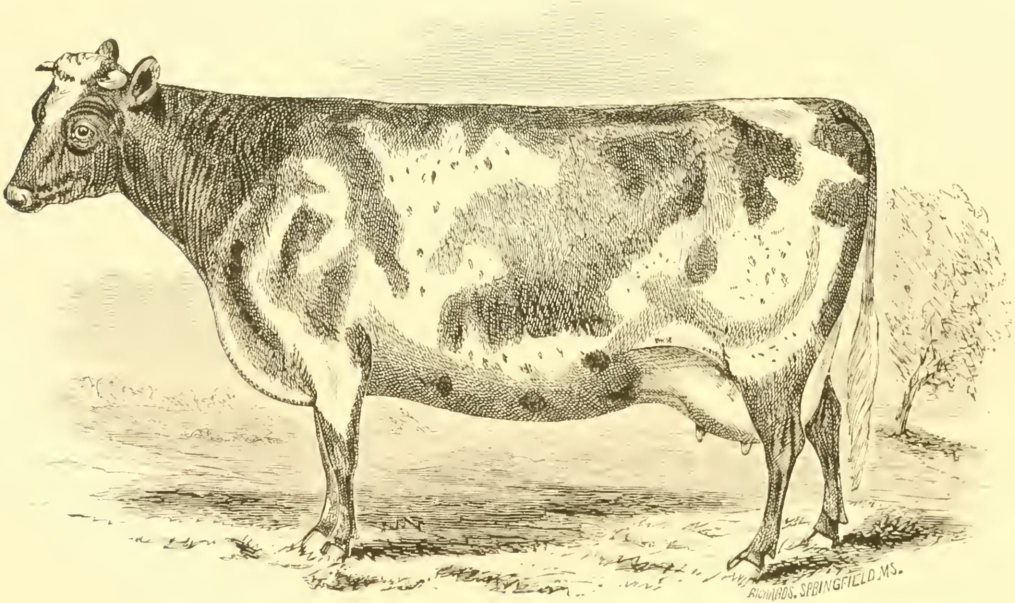
Now it requires no great amount of foresight to see that we cannot expect the general exemption from contagious and infectious diseases among stock which generally prevailed in New England previous to the introduction of pleuro-pneumonia. Europe is suffering the loss of millions every year from such diseases, and the chances of having some one or more of them landed upon our shores are very great. We should place ourselves in a position to grapple with them more promptly and more intelligently than it has been possible in the circumstances in which we were placed on the sudden breaking out of those we have had occasion to know so much about. To be forewarned is to be forearmed. I feel quite confident that a thoroughly competent Cattle Inspector, coöperating with an intelligent Board of Cattle Commissioners, would be of great service to the farming community, and give us an immense public advantage in grappling with any newly imported contagious disease among stock.

The suggestion in regard to Farmers' Institutes, made by the Board of Agriculture at the annual meeting and to be found on page 339 of this Report, has been promptly adopted by the Middlesex North Agricultural Society, which called an Institute meeting at Lowell, on the 5th of April, for the purpose of lectures and discussions. That meeting was well attended, and was productive of good results; and though the season of the year was unpropitious, at the opening of the active labors of the spring, it clearly proved the possibility of great and substantial good to be accomplished by the Farmers' Institutes of Massachusetts. It is believed that other societies will find this the means of awakening a greater degree of public interest, of diffusing valuable information, and of fulfilling their important mission among the people of this Commonwealth.

CHARLES L. FLINT,

Secretary of the State Board of Agriculture.

BOSTON, January 25, 1871.


RICHARDS. SPRINGFIELD.MS.

BETSIE No. 274.—Owned by WILLIAM BIRNIE (Springfield).
See Preface to the Abstract.

APPENDIX.

REPORTS OF DELEGATES

APPOINTED TO VISIT THE

AGRICULTURAL EXHIBITIONS.

ESSEX.

In pursuance of assignment by the State Board of Agriculture, I attended what I supposed was the fiftieth annual exhibition of the Essex Agricultural Society, at Ipswich, on the 27th and 28th days of September, 1870. The Hon. Marshall P. Wilder, in his report of last year, says that the fifty-second annual exhibition was held the preceding fall; but as he also states that he had been absent twenty years, it is not wonderful that like Rip Van Winkle he "was sorely perplexed" after remaining away from the scenes of his earlier days for so long a period, and even without "that flagon" which addled Rip's poor head so sadly, our honored associate might well confound dates, and out of sheer respect for the hospitable officers of this ancient society, push it backward a year or two towards a riper old age. In fact, when one learns that it has had presidents, secretaries and treasurers holding office ten, twenty and twenty-five years, it is but natural to look upon it as a time-honored institution, and deserving of all the longevity man or time can bestow upon it. This society was really formed in 1818, and is fifty-two years old; but as the programme calls the show of last fall the fiftieth annual exhibition, I presume the organization of the society preceded any exhibition of stock or crops, two years, so that it is not necessary to abate in our respect for it on account of any immaturity. The antique flavor of this society betrays itself in many peculiarities—such as the absence of trotting and racing matches, the special attention given to ploughing matches, the possession of a farm and library, and no charge for entrance to fair ground, the remnants of lace-weaving among its manufactures, the premiums offered for substantial improvements, the requirement of full reports to be signed by *all* the members acting on the committees, and a request for further reports from the chairman of each explanatory of the opinions of the committee upon the subject referred to them, the migratory character of the annual exhibitions—the mountain going to Mahomet instead of Mahomet to the mountain,—and last but not least, the sterling, old-fashioned hospitality of the officers and members of the society.

I cannot undertake to report upon all, nor hardly any portion of what was exhibited on this occasion; but can only mention a few of the most noteworthy and striking objects; and as animals come first in order, the two of noblest sort, that drew crowds and shared the interest of all spectators with their competitors in other departments, were the Hon. B. F. Butler and the eloquent delegate from the Essex society to this Board. The female sex especially, appeared to be captivated by the eloquence or the appearance of these gentlemen, and the large church was crowded to suffocation to listen to the first attempts of the member from Gloucester to expound the principles of agriculture, and the dinner-table was subsequently abandoned when it was ascertained that each of the day's favorites was to address the multitude in the edifice above. Full as rare curiosities, and perhaps more highly colored for the occasion than even the eloquence of the orators, were a trio of purple Leghorn fowls whose gay plumage excited the most intense interest, until the discovery was made that it was dyed.

The other stock on exhibition was of an excellent character, especially the kine of Messrs. Appleton, Rogers, Dane and others, and the Jerseys of the last-named gentleman were richly deserving of the premiums and approbation they received. The horses of the same gentleman, and his flock of Cotswold sheep, those of Mr. Appleton (D. F.), and the promising colts of Messrs. Rogers, Griffin, Balch, Martin, Gardner, attested public spirit and private enterprise in these departments, and the united testimony of the habitués of the society's exhibitions was that at this one there was the best show of horses, cows and sheep within their memory. The horticultural hall was the only place at which an entrance fee was charged; and accustomed as we are in our part of the State to exact the last penny from the most juvenile aspirant before he can enter even the grounds of the society, it was really refreshing to behold the cattle-shows free to all comers, yet "still the wonder grew" how this society could be in such a flourishing condition on the slight returns from the fruit and vegetable visitors and the annual dues of members. When inquiry is made as to this anomalous condition of things, the urbane president refers to the "Treadwell Farm" owned by the society, and valued at seven thousand dollars, or thereabouts; but that fact only adds additional mystery to the riddle, as what sane man could suppose a farm could be run to any profit by a "committee of arrangements" headed even by such practical and accomplished farmers as the president of the society and its delegate to this Board? Without further essaying to evolve a solution of this puzzling conundrum I pass to the exhibition of fruits, flowers, vegetables, bread, butter, honey, and fancy work generally, which was gratifying to all observers, and the favorite and most profitable fruit of the county even brought tears into the eyes of the more contemplative. Apples and pears seem to be specialties also in that favored region, so fine and luscious were they in appearance, and their taste not breaking the promise of their looks; and Dr. Nichols, no mean judge of fruits, was observed noting with admiration the rich complexion of each favored variety, and drawing, possibly, favorable conclusions as to the efficacy of some newly manipulated compounds which had been tested in manuring the orchards.

The ploughing matches in the absence of horse trots, were of course well attended, and at their conclusion the crowd, like the celebrated French army, marched down the hill, and then, headed by the orator of the day and a band of music, marched up again, and into the church, where an address was delivered by Hon. B. F. Butler, on French husbandry—*i. e.* husbandry of the soil, the other being rather soiled husbandry—and a very flattering tale was told on one side; the great difference in the wages received by the toilers on that side of the water as compared with the same class here, not being taken into the argument. But the crowd came to see and hear the representative of the *scaly* classes, and were not disposed to criticize severely, and the hardy fishermen who inhabit near where their champion pitches his tent, probably considered that those who ploughed the furrows of the land earned their living as easily and were as well paid as those who plough the vasty deep.

The Dinner

Was provided in the basement of an adjoining church, where fish, meats, poultry, vegetables and fruits of all kinds, and the inevitable coffee and pies, were like an army with banners; and some 400 to 500 guests soon made such a clatter that all mouths were closed save to receive the food entering therein, and the monotony of eating was agreeably broken, after a wholesome hour not unwisely spent, by the announcement that the concluding exercises would take place in the church above. Thither all at the tables repaired, together with numerous outsiders, and the genial president, Gen. Sutton, opening the *bawl* by some sensible and practical remarks, was followed by other members of the society, by the orator of the day, Dr. Loring, Secretary Flint and others. The Doctor and the orator had a good-natured tilt at each other, to the satisfaction of the spectators who were probably as indifferent to the result as the woman who witnessed the combat between her husband and bruin. Your delegate was also called upon to respond in behalf of the State Board, and he did so; but it was so soon after dinner, the ladies who filled the body of the church looked so fresh and charming, the sturdy old farmers so knowing, the president of the society was so complimentary in his introduction, and the gentlemen just alluded to, between whom your delegate was sandwiched, glanced so obliquely across or at your delegate, that he has much reason to doubt if he did justice to his position, though he stood up manfully for farmers being educated, and thus put in all respects upon an equal footing with the rest of American kind, and even went so far as to hope to see the day when farmers' wives and daughters would possess such knowledge of the pursuits of their husbands and parents, and especially of horticulture, that they would be valuable adjuncts instead of hindrances in the progress of agriculture. The Secretary of this Board, Mr. Flint, made some very happy and apposite remarks on *roads*, of which he is just now the Colossus, and his audience appeared to swallow his remarks as greedily as if they believed them all. But I fear the stones which the Secretary threw into them instead of bread, much interfered with their after digestion.

Finally your delegate came away from the pleasant precincts of Ipswich, satisfied that the Essex Society is flourishing, notwithstanding horses trot not on its tracks, money is not taken at the grounds of its exhibitions, that it runs a farm by a committee, that it keeps its officers in service for a great number of consecutive years, and that it has only a half century of experience.

R. GOODMAN.

MIDDLESEX.

The seventy-sixth annual exhibition of the Middlesex Agricultural Society, was held at Concord, on Tuesday and Wednesday, October 4 and 5, 1870. This is one of the oldest societies in the State, dating back in its origin, almost to the period of the Revolution, yet exhibiting no indications of decline, but manifesting all the elasticity and vigor of youth. With well-located grounds, a large, convenient building, adapted to all the wants of the society, a government composed of active, energetic men, and surrounded by an intelligent and industrious population, it may confidently look forward to increasing usefulness and prosperity, and to the exertion of a wider and yet wider influence upon the agricultural community. Perhaps the debt incurred in the erection of the hall may stand in the way, but I am sure that the wealthy and public-spirited members of the society will not permit this, but will say the word and it will cease to exist.

There were more than one hundred head of cattle of the various breeds in the pens, and had it not been for the severe storm on Monday, and the unpromising state of the weather on Tuesday morning, the number would probably have been much larger. The Ayrshires, including several fine specimens, were most numerously represented. The Jerseys, Shorthorns and grades carried off several premiums. The Dutch cattle from Mr. Chenery of Winthrop, and J. S. Munroe of Lexington, made an imposing appearance, and the Swiss bull, and five cows from H. M. Clarke's of Belmont, needed no musical bells to call attention to their gentleness and beauty. I would respectfully suggest to the farmers, the importance of bringing out next year more young stock, and also fat and working oxen, of which there must be large numbers in the county. Calves and young heifers mark the progress of improvement in raising stock, from year to year, and a long team of handsome oxen, with calm and dignified step, marching round the track, makes an interesting feature in any cattle-show. The ox is a noble animal, and I can readily understand why Mr. Webster, as his life was drawing to a close, was so desirous to cast one more look upon the petted animals which knew his voice and step, and always welcomed him whenever he entered the barn.

The collection of swine was quite good. Most of them were of the Columbia County and Chester White breeds, and gave evidence in many cases of careful keeping, and sound judgment in selections.

The ploughing match was finished before I arrived on the grounds, but a view of the lots which had been ploughed, satisfied me that there must have been excellent ploughs, and skilful drivers and holders, to have made such good work as was exhibited on several pieces of ground.

I do not feel competent to speak of the grand cavalcade, nor of the trial of colts, family and matched horses on the track; still less of the trial of speed of trotting horses; but I was informed by several good judges, that in all these departments the exhibition was very successful.

The products of the farm and garden, as well as the handiwork displayed in the large hall, afforded much gratification. The extent, beauty and excellent arrangement of the numerous articles presented for the examination of visitors, cannot be too highly commended. In the large display of vegetables, there was a freshness and fullness of growth quite remarkable, when we consider that there had been little or no rain for nearly twelve weeks. Of tomatoes, onions, potatoes, corn, rye, wheat and oats, the samples were very fine. A dozen cauliflowers from Mr. Webster Smith, of Lexington, were remarkably large, and sold, during the fair, at one dollar each. Most of the samples of tomatoes were of the "Gen. Grant" variety. The raising of tomatoes for the market is said to have been quite profitable the past season. The president of the society stated that from three acres of land, he had raised and marketed fourteen hundred boxes, each containing about one bushel, at an average price of one dollar and forty cents the box.

Among the potatoes were large and handsome specimens of "Breese's Peerless." Mr. G. Heath, of Concord, stated that he had raised fifty-one marketable bushels, and three bushels of small potatoes, from one bushel of seed.

There were about two hundred dishes of apples on the table. Fair and handsome specimens of the Hubbardston Non-such, were exhibited, from the original tree. The samples of the Baldwin in all the collections were quite fair. The president of the society stated that he had now fifty acres under cultivation, set with this variety alone. The show of pears numbered one hundred and twenty-five plates.

An interesting feature in the display of grapes was their perfect maturity. No samples of Concord could be more perfect in cluster, richer in bloom, or more fully ripened, than were the contributions from the vineyard of Capt. J. B. Moore, of Concord.

A fine show of pot plants by the president of the society, many specimens of cut flowers, and two extensive collections of native plants and lichens filled the centre table. One of these collections put up by Mrs. Elizabeth Fisher, of Waltham, included three hundred species. The other collection, numbering two hundred and twenty-three specimens, was contributed by Miss M. E. Carter, of Woburn.

Of bread, preserves, pickles and jellies, the show was large.

The ladies of the county contributed largely, useful and fancy articles, which were arranged in glass cases, and attracted great attention.

The poultry, arranged in the basement story of the hall, was said to equal in numbers and quality, that of any preceding show.

The Ames Plow Co., Parker & Gannett, of Boston, and Wm. E. Barrett & Co., of Providence, R. I., exhibited a large collection of farming implements, well made, and highly finished.

On Wednesday, at 12 o'clock, a procession was formed on the grounds, and marched to the hall, where about six hundred persons sat down to an excellent dinner, provided by Mr. J. B. Smith of Boston. After this had been disposed of, the president, John Cummings, Esq., made an interesting and instructive speech, upon the cultivation of vegetables and small fruits, expressing with great confidence, his opinion, that the farmers of Middlesex would find it very profitable to engage largely in this branch of business, for the supply of the Boston market. He was followed by Hon. Judge Hoar, and Hon. Geo. M. Brooks, the deservedly popular representative of the seventh congressional district, who, with wit and eloquence, held the close attention of the assembly, and added very much to the interest and pleasure of the occasion.

I cannot omit to say that I did not see a single intoxicated person, or hear a profane word, and that the most perfect order everywhere prevailed, during the two days of the show; and I am sure that when the large assembly separated, it was with the feeling that it had been a pleasant and profitable gathering; and for my own part, I have the most agreeable recollections of the kind attentions and hospitality of the president and many friends in Concord.

At the close of the exhibition, by the polite invitation of Mr. Moore, I visited his farm, in company with several friends. I have only to say, that if any one wishes to learn how to raise grapes, strawberries, raspberries, asparagus, &c., economically, successfully and profitably, let him visit Mr. Moore, and take a few lessons from his practice and experience, and the time will not have been spent in vain.

ALBERT FEARING.

MIDDLESEX NORTH.

As a delegate from this Board, I attended the sixteenth annual exhibition of the Middlesex North Agricultural Society, held at Lowell, September 28 and 29, 1870.

The first day was devoted to the reception and arranging of the stock on the ground, and the articles for exhibition in the hall.

There was a fair exhibition of stock of the various kinds; among those we noticed were some fine specimens of Jerseys, and other pure breeds. We also noticed a string of oxen from Dracut, containing some very fine cattle; also a pair of steers three years old, that exhibited remarkable training.

The entries for horses were but few, and those not of superior quality, we should judge. We think we shall be supported in saying that the show was not all horse.

There were but few entries of sheep, and those were not of superior quality. Of swine, there was a fair exhibition.

The exhibition of poultry was excellent. Among them we noticed some nice turkeys, and also fine geese; one bird was said to weigh forty pounds.

In the hall there was an excellent display of the various articles.

Vegetables were there in abundance, and of superior quality.

We were particularly pleased with the fine display of fruit. We noticed that our friend Clement contributed liberally to the fruit department, and we think the society is largely indebted to him for the arrangement and fine effect in this department.

The products of the dairy were fully represented. We were pleased to notice in this department that those receiving premiums on butter were required to furnish statements of the manner in which it was made. We think it might be a good idea for other societies to adopt; it certainly would tend to diffuse a knowledge of good butter-making.

At one o'clock a large number of ladies and gentlemen sat down to a dinner at which Col. Ladd, the president of the society, presided. After a few appropriate remarks, he introduced to the audience His Excellency Gov. Claflin, the agricultural orator of New England, (which proved to be Dr. Loring, a member of this Board), Gen. Butler, and Ex.-Gov. Smyth of New Hampshire, all of whom made excellent remarks, which are fully reported in the printed reports of the society to this Board.

The fair throughout was characterized by good order and sobriety, and in the opinion of your delegate, was a success.

I would here tender my thanks to the president of the society, and to their delegate to this Board, for courtesies and attentions received during my visit to the fair.

NAHUM P. BROWN.

MIDDLESEX SOUTH.

I attended the fair held at South Framingham, on the 20th and 21st of September last. The weather was fine but hot, and exceedingly dry. The fair was well attended and the display in the various departments, was large and of a superior quality. The society is in a flourishing condition, a good share of its members possessing both the will and the means for advancing the cause of progressive agriculture.

Their real estate valued at $20,000, consists of a spacious park, conveniently located and well fenced, a commodious exhibition hall, and covered stock pens and sheds sufficient to shelter a large amount of stock. A new covered shed, built the last season, and costing $1,500, is, we think, unsurpassed for economy, utility and convenience, and we desire to recommend it as a model, to societies contemplating similar improvements.

Much attention is given by farmers in this vicinity, to the breeding of neat stock, horses, sheep, swine and poultry, and judging from the specimens on exhibition, they are not a whit behind the best breeders in the State.

Among the leading exhibitors of neat stock, were T. B. Wales, Jr., E. F. Bowditch, the Sturtevant Brothers, of South Framingham, and C. H. Tilton, of Ashland.

The show of fruit in the hall, was much better than we expected to see, considering the long continued drought, which was severely felt in this county. A very large variety of grapes grown in the open air, appeared to be perfectly ripe and made a fine display.

The society pays $1,129, in premiums, none of which is offered for grade or native bulls, or horses owned out of the county. Liberal premiums are offered for the best reports and prize essays on subjects of agricultural interest.

One suggestion by way of improvement, we very respectfully desire to make. The usual amount of side shows, lung-testers, dealers in patent medicines and Yankee notions, which seem to accompany agricultural fairs, were allowed to prosecute their business quite too near the hall. Were they located more remote, say in a south-easterly direction from the new shed, it would add much to the comfort and convenience of visitors.

I would here express my obligations to the delegate and the officers and members of the Middlesex South Society, for their uniform kindness and untiring efforts to make my visit both pleasant and agreeable.

A. P. Slade.

WORCESTER.

The fifty-second annual exhibition of the Worcester Agricultural Society, was held in the city of Worcester on the grounds of the society, September 22 and 23.

The fair opened well, the weather was good, and at an early hour the large collection of people showed that they were interested in the success of the society.

The show of stock as witnessed by your delegate was very creditable to the society, there being about four hundred head on the grounds.

The Jerseys were the most numerous, there being 96 entries; of Ayrshires, 45; North Devons, 15; of Durhams, 13.

The principal exhibitors of Jersey stock, were O. B. Hadwen, 22 head; John Brooks, of Princeton, 12 Jersey cows; W. T. Merrifield's herd of 24 head; and James Thompson, of Worcester, 20 Jersey cows and 3 bulls.

Of Ayrshires, Benj. Harrington of Westborough, herd of 13 cows and his Ayrshire bull, "Jethro"; Nelson Walling of Millbury, herd of 17 Ayrshires; Wm. Eames of Worcester, Devons and grade Devons; Samuel Ellsworth, Worcester, herd of grade Durhams.

The specimens of stock on exhibition were of high quality, indicating, however, that the principle of stock-growing in this section seems to be, not to improve the size of the animal, but to produce the most butter and cheese.

Elliot Swan, of Worcester, presented the largest pair of oxen on the ground, weighing 5,100 pounds.

The ploughing match came off on the society's grounds, there being sixteen yoke of oxen and two horse teams for trial. The ground was very dry, but the work was well performed. Soon after the ploughing match came the trial of working oxen and steers, twenty-five pairs competing, most of them Devon, and what was called by this society, mixed. Both classes performed their work with superior excellence, and we are happy to say that with some few exceptions, the teamsters are entitled to the highest commendation for the perfect control they had over their teams without the brutal use of the whip.

There were but few entries of sheep, mostly Cotswold and Leicester. A few specimens of Chester County swine. Thirty entries of poultry, some fine specimens.

Of agricultural implements on exhibition, the Ames plough, the

Buckeye, Union and Little Giant mowing machines, the Bay State and Whitcomb rake, the Bullard and American hay-tedders, rank high in the estimation of the public.

Of butter and cheese, there was quite a respectable show. It is not necessary for me to enlarge upon this subject as the statistics have been laid before the public by the dairymen's associations.

The show of apples, pears, grapes and vegetables in the hall, was very creditable. It was manifest that the horticultural exhibition which was being held at Mechanics' Hall, detracted very much from the show in the Agricultural Hall.

The annual dinner, which was excellent, was served in the society's hall to over three hundred guests. After the repast, speeches were made by the president of the society, Hon. Oliver Warner, Dr. George B. Loring, Rev. J. O. Peck, of Springfield, and Judge Chapin. All spoke in their usual felicitous manner, quite as interesting to most as a set address would have been.

The second day was devoted to the exhibition of horses. The show of matched horses was very fine, with a fine place to exhibit them. J. G. Wood of Millbury, exhibited several brood mares with fine colts by their sides. F. E. Abbott, his thoroughbred mare and colt. The specimens of colts two and three years old were excellent.

After dinner the second day the reports of committees were read.

Then the delegate of the State Board from this society (Thomas W. Ward), very politely invited me to his hospitable home in Shrewsbury, where we spent a few hours looking over his large and valuable farm.

This society has large and commodious, grounds with fine, convenient buildings, and the funds of the society are judiciously expended.

IMLA K. BROWN.

WORCESTER WEST.

The twentieth annual exhibition of the Worcester West Agricultural Society, took place at Barre, on the 29th and 30th of September. By your favor, it was my privilege to represent this Board on that occasion.

The long ride of twenty miles from Worcester, over the Paxton hills, was greatly alleviated by the genial company of our worthy secretary, Brother Johnson, and a friend from Wayland, whose mirth-provoking jokes, and lively repartees served to make us unmindful of the rough hills and the deep valleys that we encountered in our journey. Our sorrel span, partaking of our hilarity, soon brought us to the entrance, where the officers of the society awaited our arrival, and took us in charge and conducted us through the extensive grounds, amid throngs of happy people who are gathered to celebrate this autumn festival. This society is located among the hills whose crystal springs flow eastward into the ocean, and westward into the beautiful Connecticut. Among the green pastures of these hills, roam the finest cattle, and the fertile fields yield the richest products of the farm and dairy.

The fair poetess of the occasion can best express my meaning:—

"Though autumn with his gorgeous robe
Reigns sovereign in sweet summer's place,
So kind and genial is his smile,
We scarce the lines of change can trace.

The wealth of orchard, field and wood,
He gathers in his nut-brown hand;
Behold the treasures he hath brought
Aided by labor's tireless band.

Let those who say our grand old hills
Will not repay the farmer's toil—
That wealth and comfort are not wrought
From out our Bay State's rugged soil,—

Come to our pleasant hall to-day,
See beauty, art, and taste arrayed,
With nature's gifts, for household use,
In all their loveliness displayed."

That the character of a people may be correctly judged by the character and climate of the country they inhabit, there can be no doubt. The free, energetic character of the sturdy yeomanry of this region fully conforms to the beautiful and picturesque scenery of its hills and valleys, and its clear and invigorating climate. Far away from railroad facilities enjoyed by most other societies in the State, yet the farmers of this section are justly celebrated for their excellent management and successful operations of the farm and of the society.

The first day's exhibition was devoted almost entirely to the farm and its products, and the second almost as entirely to the "horse," or the "sports of the track." I think this arrangement is commendable, especially where it is thought "the horse" is becoming a too prominent feature of our agricultural shows. There is a large and very respectable portion of the community, that desires to participate in this harvest festival, who do not care to come in contact with horse-racing. And the arrangements of the first day are made in conformity to the feelings of this class. The second day being devoted to the horse features of the exhibition (if we may so speak), attracts many people from a distance, beyond the bounds of the society. The grounds being clear of all obstructions, they enjoy the whole range of the ample grounds for this purpose.

A hasty examination of the several departments of the exhibition of the first day, convinced us that the exhibition was one of no ordinary character. Every department reflected great credit on the management and interest felt by the members of the society. The cattle department was most prominent, embracing a great variety of fine specimens of almost every breed and grade of stock. Grade Durhams ruled in the dairy class. Working oxen, and fat cattle, very superior. Sheep and swine good, but not numerous. The exhibition hall presented a feast for the eyes. Fruits, vegetables and flowers, graced the tables. The long rows of splendid cheese, the excellent bread, and yellow butter, well attested the skill of the good housewives of this section. There was also a great display of art and fancy-work. The dining-hall was filled with a goodly company of ladies and gentlemen; as fair and intelligent as ever discussed the dainties of a good agricultural dinner. The president presided in an easy and happy manner, while His Honor, the Lieut-Governor, and our worthy secretary, supplemented the luxuries of the table with the luxuries of the intellect.

The answers to the questions contained in the document issued by this Board, are herewith submitted, and I am greatly indebted to the Hon. Charles Brimblecom for his aid in this respect.

Mr. Chairman, I feel that I cannot close this report without referring to two things witnessed at this exhibition,—the one of cruelty, the other of kindness. I noticed a pair of oxen chained to the fence, covered with stripes from the whip of their cruel owner or driver. What was the cause, I know not. This much I will say: the *goad* or *whip* as an instrument of terror or punishment *ought not to be tolerated* on the exhibition grounds. Animals that cannot be managed in any other way, should not be there, and he who would thus abuse them, should be taught to know that the exhibition ground is neither a cock-pit nor a bull-ring in which he is to exhibit his brutality and cruelty. Call me Hindoo if you will, still I must believe in the intelligence and affection of our domestic animals. I believe in the power of kindness to command their service, and that is all we have a right to claim.

An illustration of this beautiful principle was seen in the training of a pair of year old steers, by the young lad Miller, of Phillipston. His management and control of them, as an instance of the power of kindness in the training of animals, were wonderful, and entitle him to the highest praise.

"That which the fountain sends forth, returns again to the fountain." ELIPHALET STONE.

WORCESTER NORTH.

The eighteenth annual exhibition of this society was held at Fitchburg, September 28 and 29. Nothing is more dependent for success upon the weather, than an agricultural fair, and on this occasion it was all that could be desired. The grounds and buildings of the society are ample and convenient, and when the approach to the main entrance is tastefully laid out, and the land in the vicinity improved, will be admirably adapted to the uses for which they are designed. The location is easy of access both by the highways and the Boston and Fitchburg Railroad, and being near a growing city the property must increase in value with advancing years.

It is to be hoped that the officers, now that their president is also president of a bank, will make a successful effort to pay up the indebtedness of the society, and so render it financially independent. If the farmers here will but do their duty in prompt attendance at the annual meeting, and at the fair, they may derive immense advantage from the active coöperation of the wealthy, intelligent and enterprising manufacturers of Fitchburg and vicinity, who have done so much to introduce improved stock and render their exhibitions attractive. The working oxen and fine grade or native cows and young stock, should be brought out in full force, notwithstanding such famous breeders as Augustus Whitman, E. T. Miles and John Brooks are expected to exhibit splendid herds of thoroughbreds.

The grade bull, however, can hereafter be excused from putting in an appearance, as this society will pay him no more premiums. Peace to his ashes.

There were upon the grounds for exhibition, admirable specimens of Shorthorn, Hereford, Ayrshire and Jersey bulls, of the best form and pedigree, which may be of inestimable value to the agricultural interest of the region, if properly appreciated and used.

The whole number of herd-book animals was eighty-four, and among them some remarkably fine milch cows of three different breeds.

Mr. Whitman's herd of sixty Shorthorns, the best in Massachusetts, was well represented by seven cows, which were models of size, form and milking capacity. The greatest amount of milk given in one day by any one of them, was forty-four pounds. "Mountain Belle" yielded in three hundred consecutive days, an average of more than twenty pounds and a half per day. Such a Shorthorn cow would not need the aid of another to raise her calf, as has been reported of some. Mr. Whitman deserves much praise for his well-directed efforts to bring together a herd of this breed with good milking qualities, which have been too often neglected by breeders.

The beautiful Ayrshires of Mr. Miles were evidently chosen with excellent judgment and taste as to form, color, udder and horns, in fact, everything desirable in a perfect cow to please the eye. If this herd is bred as skilfully as it has been selected, the stock of Maplewood will be in active demand. Though wanting in the magnificent proportions of the Shorthorns, it is highly probable that these cows will afford for the food consumed, as much value in milk and beef as those of any breed. Mr. Miles has published a catalogue of his herd with a complete record of their milking for one year,—an example worthy of imitation.

The Jersey herd entered by John Brooks, of Princeton, has an established reputation; and while the farmers generally do not admire the style of this breed, they command high prices for the use of those gentlemen who can afford the luxury of cream, when ordinary mortals must be content with milk. Mr. Brooks also exhibited a fine Hereford bull and two well-trained pairs of superb grade Hereford steers, raised in Maine. He thus offers his brother farmers an opportunity to improve their working oxen, grade steers of this kind combining the activity and beauty of color of the Devons, with greater size.

There were many fine native and grade cows at the fair, of which the best were entered by Mr. J. P. Reed, of Princeton. One of his grade cows of the Holderness breed, gave an average of more than fifty pounds of milk per day for one week in June.

The show of horses was meagre in respect to breeding animals, and gave abundant proof that the farmers of the county do not attempt to supply the home market. There were present, however, two stallions, a few breeding mares, and some very good colts. The carriage horses were excellent, especially the stylish pair of bays belonging to Col. Crocker. The driving horses and trotters were numerous and of good quality.

The races brought out the people of all classes, and were for the most part as interesting and as well managed as could be expected. The foot-race was not such as is usual or desirable; one of the competitors appearing literally stripped for his work, having substituted a single breech-cloth for the ordinary articles of dress. As even with this light weight he was unable to win, his excited friends rushed on to the track and pushed him forward, at the same time preventing his competitor from getting before him. This created intense excitement, and of course deprived him of any chance he might have had to cross the line first by special exertion of his own.

There were several lots of swine, all of the large breeds, some specimens having a live weight of about 600 pounds. The Chester White seems to be the favorite breed among the farmers of this society.

Sheep were very few and of the large breeds, the best being Cotswolds.

The exhibition in the hall was very creditable, excelling particularly in apples and grapes. Of the latter, fifteen varieties were well represented; the finest in appearance being the Concords of Dr. Fisher, and the Ionas of M. S. Heath.

J. M. Sawtelle contributed a large collection of cut flowers and plants in pots, and among other interesting species was a Turk's cap cactus from the West Indies.

The address was a home production by an honored and active member of the society, Col. Alvah Crocker. His subject, "A New England or a Western Home," was a most important one for the young farmers of Massachusetts. The doctrine inculcated was that with industry and intelligence a young man could find no better place to live in than our own Commonwealth, and no more honorable, healthful or desirable occupation than farming.

A good dinner was provided on both days of the fair, and the hour after the manual exercise was occupied in the usual American style.

On the whole, the affairs of the society appear to be judiciously conducted and its usefulness increasing.

Your delegate was enabled by the kindness of the proprietors to visit the farms of Lyman Nichols, Esq., and Jabez Fisher, M. D., and was deeply interested in the story of their many improvements. The Board of Agriculture may feel a peculiar pleasure in the remarkable success of Dr. Fisher, who was in part, at least, educated on the Board, in his efforts to demonstrate the value of intelligent skill and thorough business habits in agriculture. He has just received the first premium of $50 for the best cultivated farm, and has sold from thirty-four acres during the past three years, produce worth an average of $2,575 per annum, besides the amount paid for labor. The doctor is a bright and shining light in the agricultural world, and earnestly and successfully striving to shine more and more. May he find many worthy rivals among the farmers of Worcester County. W. S. Clark.

WORCESTER NORTH-WEST.

The fourth annual exhibition of this young and vigorous society was held on Wednesday and Thursday, October 5th and 6th, 1870. My engagements were such that I could not reach Athol until the afternoon of the first day of the show, consequently I did not see quite all of the neat stock on exhibition; but that remaining upon the ground on my arrival was very creditable to the farmers of that hardy section of the Commonwealth and gave convincing, unmistakable proof that already this society has made its mark, and exerted a beneficial influence upon this very important and leading branch of husbandry.

I was prepared to find the members of this society had improved on their early efforts, when they used the public common for their show ground, and a neighboring church basement to exhibit articles on exhibition, but not hardly prepared to see the leading citizens of that and the surrounding towns, vying with each other to benefit the society and make sure of success.

A very pleasing feature of the occasion, was the large number of farmers present, with their wives and children, and I was glad to look into their honest, sunburnt faces, rejoicing as they were in the success of the two days of the exhibition, and beautiful autumnal days they were, neither too hot nor too cold, contrasting wonderfully with the days preceding their last exhibition.

Perhaps I may be allowed to say here, that I improved this opportunity and took my helpmeet with me, partly to see friends, and to assist me, knowing that four eyes could see more than two, especially in the crowd that filled the hall of exhibition.

The time would hardly suffice to speak of the contributions under the head of manufactures, fancy articles, fruits, flowers, fine arts, all worthy of honorable mention and sure witnesses of the advanced culture and taste of the people.

The grounds owned by the society are beautifully located, bounded as they are by groves, rolling hills, and a charming, transparent lake, uniting distant and picturesque landscapes unsurpassed for natural beauty and loveliness, or suggestive of happiness and enjoyment.

The second day of the fair satisfied me that no portion of the State could excel the show of fine horses entered for exhibition, and I was completely surprised at the large number of beautiful animals on the grounds, owned in that locality.

The dinner tables were crowded by members of the society, with their ladies, showing conclusively, that the people appreciate the value of this social occasion, and among them were veterans of the soil, and some high in social position in our beloved Commonwealth.

In the department of flowers one lady contributed nearly two hundred varieties of cut flowers, all arranged with taste and beauty unsurpassed. Another lady contributed twenty odd varieties of pinks fragrant with perfume, surpassing Solomon in all his glory, who was not arrayed like *one* of these.

The officers of the Society have shown a wise forethought in all of their arrangements, and I could but congratulate them on their deserved pecuniary success, and have no doubt but there is a successful future in store for them.

I have not entered into detail, as their annual Transactions will show who were the principal and successful contributors.

We are indebted to the President and Secretary for marked attention, and to our worthy associate, Charles C. Bassett, Esq, and his family for hearty Christian hospitality.

LEWIS H. BRADFORD.

WORCESTER SOUTH.

At the request of Hon. L. Saltonstall, who was appointed a delegate to the Worcester South Society, I went to Sturbridge on the first day of the exhibition, September 8th. This society possesses a fine tract of land, embracing some twenty-five acres, on which stands a large, substantial and well arranged building admirably adapted to the purposes of the show. There were several entries for the ploughing match, and the work was very well done considering the condition of the soil, for the ground was exceedingly parched and dry from the protracted drought. The show of cattle in the pens was rather limited, and the same is true in regard to sheep and swine; some good fowls were shown, but the exhibition was deficient in this department. Of working oxen there was a very fine show, some of the sturdy pairs being fully equal to anything we have seen. The town teams were worthy of praise. In the hall there was a fair display of apples and other fruits as well as of vegetables. The exhibition of butter and cheese was extremely meagre, and, excepting a single large cheese from my friend Hubbard, not worthy of attention. The ladies' department was well filled with articles very creditable to their taste and industry. Some good specimens of wheels, harness, and other manufactured articles were contributed.

There was an excellent dinner provided by the society in their own building, where for a reasonable sum all the members, with their wives and daughters, could find a place. After the dinner an address was delivered by the Rev. Mr. Richardson of Worcester. It was replete with good sense and sound suggestions and was well received by the large audience. This society has no reason to be discouraged, for the season was a very unfavorable one. The pastures were brown and sere, the brooks and springs were dry, the corn fodder even parched and withered, and vegetation on every hand drooping or destroyed by the long and excessive drought. The fair grounds were so dusty that it was impossible to go from point to point without serious discomfort, and these causes without doubt operated largely to lessen the interest in this annual festival.

JAS. F. C. HYDE.

WORCESTER SOUTH-EAST.

The annual cattle show and fair of the Worcester South-East Agricultural Society, held at Milford on the 27th and 28th days of September, was attended by your delegate, in accordance with his assignment therefor.

In making his report he may be able to do no more than his predecessors have done before him. As their reports will not absolve him from his duty, and their eyes are not those he looked through, he can do no less than offer his notes at this time.

With vivid recollections of the nature of the soil, the character and quantity of the farm products, the quality of cattle and other stock, the style of farming in vogue in that section of the State some thirty years previous, and having very little knowledge of it since that time, it can be imagined that a continued residence during that interval of time on the banks of the Connecticut had not tended to exalt the opinions of your delegate in the matter of farming on the granite hills of Milford, Mendon, Upton and the neighboring towns, or of the peaty swamps and meadows bordering on the streams and brooks watering those localities.

The first matter that occurred to unsettle any preconceived notions of your delegate, was the inspection of the farm premises of the president of the society, Wm. Knowlton, Esq., at West Upton. Valuable and extensive improvements, returning abundant and remunerative crops, covered grounds once familiar to us as stumpy, rocky pastures and out-lands. Convenient buildings erected and filled with hay and other crops, excellent work houses and utensils and thorough bred stock, confirmed your delegate in an old opinion, that it is not the *place* but the *man* that makes the farm, and that the president of that society possessed one more farm in the Greeley sense of the term than Greeley himself, viz., his own farm, one above him, one below him, and one all around him; for the example of such substantial and paying improvements will be infectious and stimulating to all around him to do likewise.

Early upon the fair grounds upon the first day of the show we were fully able to note the many choice animals brought in. Among the cattle Ayrshires and Jerseys predominated. A very few Shorthorn Durhams were present. Taking it for granted that dairy products were more profitable than beef-making, in a population so largely mechanical, the fact was not a surprise.

Mr. Knowlton, the president of the society, exhibited Durhams, Ayrshires and Brittany cattle, all thoroughbred and choice animals. He had also on exhibition several imported Ayrshire calves, which with his careful rearing and good feeding, must in the future add much to that class of stock in the limits of that society.

C. H. Tilton, of Ashland, exhibited his herd of Dutch cattle. Their fine figures and peculiar markings of black and white attracted much attention.

There were many fine specimens of milch cows and heifers which would grace any man's farmyard and no doubt please his wife by the quality of milk and butter they would yield. If not the crowning excellence of the cattle department, it was at least the most interesting, to witness the training of the working oxen in the trials of draught and docility. Long ago "Dull as an ox," passed into a proverb. At Milford the proverb is totally ignored. The intelligence and aptness displayed by some of the trained oxen were remarkable. One was disposed to place them and their trainers on the same plane with the deaf and dumb who learn to talk, and their teachers.

Their evolutions in drawing, backing, changing places, lying down and getting up again, going and coming at the gentlest call, without the slightest appearance of being actuated by fear, have been fully set forth in other papers, but were nevertheless novel revelations to your delegate.

The show of horses was particularly fine in the class of colts. Some of them were animals of great promise, showing marks of good breeding and sensible training. The profit of rearing and breeding horses in that section of the State, is a matter upon which your delegate is not competent to give an opinion.

The long continued drought had affected all the interests connected with the show, and none more than the ploughing, which was indifferently done, from that cause alone, as the teams and teamsters seemed fully competent to perform their allotted tasks.

The stock in the pens suffered for the want of water. They made their wants known as intelligently as they could and in a way that all understood, but were powerless to remedy.

The exhibition in the hall, reported not equal to some of former years, would satisfy any reasonable mind that the finer fruits, vegetables and flowers could be made to adapt themselves to the locality of Worcester South-East as well as other localities.

A dense population of non-producers, increasing in numbers annually, should be provided with all their needs by home productions. If the farmers of Long Island and New Jersey can afford to raise small fruits and vegetables, and that at a profit, by supplying Massachusetts mechanics, surely those who live right by their own doors should do the same.

That it *can* be done is no experiment to be tried. Were this the proper place, instances could be cited of persons living within sight of the show grounds of this society, who have accumulated handsome estates from what (twenty years since) was considered almost worthless land, yielding scanty support for a couple of scrubby cows.

The address of Rev. Merrill Richardson was listened to with marked pleasure by a goodly number who had partaken of a bountiful dinner in the capacious hall of the society.

Learning that the fast trotting of the second day was controlled in a measure by parties not officers of the society, your delegate did not give that attention to its operations and trials of speed that its merits might have received, and he left the grounds with the feeling that if his future experiences as a delegate were to be equally pleasant as his visit to Milford was made by the hospitality and attention of the president and officers of the Worcester South-East Agricultural Society, he would not fear of trying to do his duty in that office. A. P. PECK.

HAMPSHIRE, FRANKLIN AND HAMPDEN.

The fifty-second annual cattle show of the Hampshire, Franklin and Hampden Agricultural Society was held at Northampton, on Thursday and Friday, October 6th and 7th. The weather on the morning of the first day was cold and uninviting, yet the grounds were thronged with people at an early hour, comparing their own stock and products, on exhibition, with that of their neighbors and competitors.

The collection of neat stock on this occasion cannot easily be forgotten by your delegate, as I regard it the best I have ever witnessed at any local exhibition in the Commonwealth.

Mr. Chairman, I do not intend to particularize individual stock, as I have in some instances in former reports, because if I did I should be guilty of great injustice if I did not mention the name of every owner of neat stock on the ground.

Allow me simply to say, that from the specimens of Shorthorns, Ayrshires and Jerseys, presented for exhibition, we must regard the exhibitors as men of rare taste and judgment; comprehending fully the laws and principles of breeding.

The stock presented by the Massachusetts Agricultural College, compared well with that of any other on exhibition, and showed that the farmer, Mr. Dillon, had given it good care and proper attention.

The exhibition of sheep and swine was very commendable. Some very fine specimens of fowls were presented.

The show of draught horses, breeding mares and carriage horses, was large, and represented by good specimens of each kind. The show in the hall was truly a magnificent display of all the usual varieties on similar occasions. Hon. Richard Goodman of Lenox gave the annual address, subject—"Cattle Husbandry;" which was listened to by a large and intelligent audience.

Remarks were made by other gentlemen, when Colonel Clark, president of the Massachusetts Agricultural College, was called for; and it affords me great pleasure to record the marked favor with which he was received upon the platform by the audience, showing clearly that he is one of the favorite sons of the Connecticut Valley. The second day was a bright, genial day, devoted entirely to the show of horses.

The concourse of people was larger than the day previous; still good order and propriety were preserved throughout the day. The bounty which this society receives from the State, is in my judgment judiciously expended, and pays a good return.

To withold the bounty would be injurious to the society, and to the Commonwealth.

Respectfully submitted.

JOHN JOHNSON.

HIGHLAND.

In compliance with your appointment, the undersigned attended the annual fair of the Highland Society at Middlefield, September 15th and 16th, 1870.

Starting from Chester Station on the morning of the 15th, we wended our way upward for several miles, over a country anything but inviting to the agriculturist, until, emerging into a higher and more open country, neat cottages and costly edifices, with well tilled fields, were passed, showing what industry and thrift can accomplish.

Arriving at the fair grounds, an area of some eight acres, on the top of the Berkshire hills, we were forcibly reminded of the significance of the name of the society, and impressed with the remarkable landscape spread out before us.

From the roof of the hall, a two-story building, ample for the accommodation of the society, the eye grasps a circuit of country of some twenty miles in extent, partially overlooking fourteen towns in the Commonwealth, and a scene of varied beauty, such as had never been our good fortune before to witness.

It was soon evident that this was to be a gala day to the community, for on the various roads were to be seen herds, flocks and vehicles, *en route* for the fair.

The forenoon of the day was occupied by the usual routine of preparation and arrangement.

At 12 M. dinner was served in an L to the hall, specially set apart for the purpose.

All the parts of the fair were now in working order, not excepting the inseparable accompaniments of the whip merchant, the candy stand and the fandango.

The grounds are not so well adapted to an exhibition as in some more favored portions of the State, for the irrepressible rock protrudes itself in many places, and interferes with the fullest success.

The marked feature of the occasion, as one would infer from the appearance of the country, was the stock, and the exhibition in this department was truly gratifying.

It might be invidious for us to discriminate between the herds of the several contributors, neither shall we presume to point out the particular excellences of the various breeds, as our practical knowledge in that particular is, to say the least, very limited.

The exhibition of sheep, swine and poultry, though good in quality, was somewhat limited in numbers, there being but four entries of swine and three of poultry.

The display in the hall was not so extensive as would have been pleasing to your delegate, but was fine in quality.

In the domestic department, there were 21 entries; in needlework, 13; in flowers, house plants and paintings, 6; in butter and cheese, 24; in fruits and vegetables, 48; in mechanical productions, 7; and in miscellaneous articles, consisting of tidies, tattens, crochet work, etc., the skilful handiwork of the housewife and the lass, there were 43.

In the evening the hall was crowded to listen to addresses from the president of the society and others, interspersed with music by the Haydenville Band.

The second day was occupied by the exhibition of horses, which was creditable both in quality and numbers, and the exercises were closed by an address from Rev. Mr. Rockwood.

We missed the ploughing match, which is an interesting feature at the fairs in the eastern part of the State. We presume that there are good reasons for dispensing with this instructive exercise.

One important quality of excellence we must not omit—the perfect quiet and order that prevailed. In our notes we find, "no alcoholic liquors, no intoxication, no rowdyism, no profanity."

As our fairs are attended largely by our children and youth, how carefully should we watch that no baneful influence be exerted on their plastic minds.

We visited this society a stranger; in leaving it we bade adieu to many friends.

To the president and secretary, with his amiable wife, we are under special obligations, for "I was a stranger and they took me in."

Long may we remember our pleasant interview with the Highland Society.

Geo. M. Baker.

EASTERN HAMPDEN.

The eighteenth annual exhibition of the Eastern Hampden Agricultural Society was holden at Palmer, on the 11th and 12th days of October, 1870.

Arriving at the park belonging to the society late in the forenoon of the 11th, we at once commenced an examination of the stock on the grounds, and found a large number on exhibition, in which the different breeds of blood stock, common in stock breeding districts, were well represented. In this connection it will be fair to say that there were no specimens which could be regarded as prodigies in size, while much the larger portion were young and thrifty animals; especially so, if we set aside the seven yokes of oxen and forty-one cows shown by Dr. Wakefield, Superintendent at the State Almshouse at Monson, which alone was a grand show. The ox-team and the cows would be hard to beat on any single farm in this State. H. M. Sessions of Wilbraham was there with a herd of 21 fine Devons, O. M. Graves with a herd of 26, Wm. R. Sessions with a herd of 18, and there were numerous smaller herds, mainly of young and thriving animals.

The ploughing match was a spirited one, with both horse and ox teams, but owing to the severity of the drought it was almost like ploughing baked clay and ashes, with the ashes largely preponderating.

There was a somewhat extensive exhibition of Chester White swine of various ages, and good specimens.

There were a few fine-woolled sheep, though there appeared no evidence that sheep husbandry is made a specialty in the region of East Hampden.

The poultry department was well represented,—turkeys, geese and ducks, with numerous breeds of others of the feathered tribe.

The vestry of a church in the immediate vicinity of the park was used for the exhibition of fancy articles, needle-work, butter, cheese, fruit and vegetables. The ladies, it was clearly apparent, had interested themselves in efforts to make the show a success. Domestic manufactures of all kinds, which are usual at such shows, appeared remarkably well. The bread, butter and cheese served as genuine appetizers.

Of fruit and vegetables there were quantities of either, and many of the specimens were large, which surprised us, for we learned that as much rain had not fallen in that locality, from the 20th of June to the time of holding the fair, as is requisite for one good shower.

In some of the apples upon the tables we observed the workings of larvæ of the codling moth in the form of ugly looking holes, and that too where it was apparent the contributor could have placed upon the table *better* specimens, if not quite as large; this is where some are inclined to err. Let it be remembered that *form*, with natural color, should be considered with size in order to make an exhibition of perfect specimens, and that no specimen can be perfect or appear well, which shows the tracks of a worm.

After the address, which was delivered by Dr. Loring, and which was listened to by a large concourse of people who seemed to be gratified and we trust were benefited, there was an exhibition of trained steers given by J. C. Pease and Geo. A. Converse, both of Longmeadow, and A. J. Hooker of Warren, each with one pair and unyoked. Never having witnessed anything of the sort before except with the educated elephants, we had formed no conception of what *steers* could be made to do; we were not aware until then that they so nearly possessed the sagacity conceded to that flap-eared quadruped of more huge proportions. That the steer, and indeed all our domestic animals possess a higher degree of docility than we have been accustomed to award to them, we were fully convinced by what we there observed.

In order to develop the docility of the class of animals to which we have alluded, it is obvious that a hasty, fractious disposition should have nothing to do with the training. On the contrary it is indispensible that the educator should himself possess a large amount of sagacity and docility. Much patience and perseverance will be requisite in all such training.

With the exhibition of trained steers closed the show for the 11th.

On the morning of the 12th the rain descended, and the show of horses to which that day was to be devoted, was in consequence thereof postponed to a future period, not named in the original programme.

Many of the horses which were designed for exhibition had, however, been already taken to the village and were being cared for at the different stables in proximity to the park. In company with President Holbrook and several other gentlemen, with overcoats and umbrellas, we visited several of the stock horses intended for exhibition, which had every appearance of being fine animals. One particularly interested us on account of his history. That horse was taken South by Dr. Holbrook, who was a surgeon in the Union army, faithfully served his master by carrying him many thousand miles, through dangers seen and probably some unseen, for three years, then returned with the Doctor still looking plucky and patriotic, will even now dance to the music of the bugle. He has drawn no pension, but is kindly treated and cared for, as all patriotic horses should be.

President Holbrook and others manifested considerable enthusiasm in relation to horses, their breeding and training, improving upon, so far as is practicable, their present excellent stock.

There was evidently a much larger number interested than in the breeding of neat stock, and the rain wet their clothing some. We judge that the ardor of those devoted to breeding cattle, and those desirous of improving the horse was in no respect dampened.

We learn that no premiums were offered on farms; but on almost every product thereof, and of the garden, which is worthy of cultivation, premiums were offered.

We found also, upon analyzing the list of premiums offered, that three were on experiments with manures, sixty dollars in all; thirteen dollars, in two premiums, on composting. The same in experiments to ascertain the relative value of concentrated manures.

Twenty-five dollars in two premiums for the best experiment in reclaiming pasture lands. Eighteen dollars in meadow lands.

Ten dollars each on apple and pear orchards. Ten dollars on ornamental trees. Twenty-five dollars on white oak or other forest trees.

Seventy-five dollars were placed at the disposal of a committee for display of "farmers' tools and mechanic arts."

Eighteen dollars in three premiums on vegetables, largest and best display. Also, small awards for single varieties of a long list of vegetables.

ASA CLEMENT.

THE UNION SOCIETY.

The annual exhibition of the Union Agricultural Society was held at Blandford on September 26th and 27th, in accordance with the assignment of the Board of Agriculture. The grounds of the society are located near the village of Blandford in an elevated and picturesque situation, and are remarkably well calculated for the purposes to which they are dedicated. The agriculture of the section covered by this society is chiefly of that description which is adapted to lands somewhat removed from a market and especially fitted for grass crops and grazing. The farms, both on account of location and quality of the soil, can undoubtedly be devoted to the production of large quantities of good hay, of a quality much superior to that grown on lower and heavier lands. And it is to be hoped that by the aid of artificial fertilizers of the best quality, combined with barnyard manure and the natural materials found there for composting, this region, and all others similar in New England, may become the great sources of supply for our hay markets.

The exhibition of the society the last year was encouraging, and indicated a laudable and intelligent interest in the objects of the organization. The show of cattle was in many respects unusually good, and attracted a number of judicious admirers as well as purchasers to the ground. The oxen and steers were of good form, thrifty, in excellent condition, and trained as cattle are only trained where the New England skill is still retained. The number of cows was large, and of good quality and size; and there were several bulls on exhibition whose blood indicated careful attention to breeding. Noticeable among these were specimens of Ayrshires of a high standard, which had been introduced into this section by the delegate of the society at this Board and by others. These animals were all hardy in appearance, and of a size well adapted to the hill pastures on which they graze.

The horses on exhibition were such as are especially useful to the farmer in his work upon the farm and on the road.

In the hall, the collection of apples, pears, grapes, peaches, quinces, cranberries and vegetables indicated great care and skill on the part of the cultivators, who inhabit this exposed and elevated locality; and the domestic manufactures gave evidence that the industrious habits of our ancestors are still retained in the farm-houses of the region.

The condition of the society seems to be good, and it is evidently stimulating the agriculture over which its influence is extended. The emulation which it has roused, and the responsibilities and honors which it has laid upon its active and useful members, are all producing those good effects which rivalry and position always exert. As one of the educating agencies of the Commonwealth, it is worthy of liberal encouragement and support.

Geo. B. Loring.

FRANKLIN.

The twenty-first annual cattle show and fair of the Franklin Agricultural Society was held at Greenfield on the 29th and 30th days of September, 1870.

The first day of the fair was ushered in with all the beauties of a September morning, and was improved by the farmers in that county from its earliest dawn till the mid-forenoon in gathering their stock and fruits and ornamental work and designs, preparatory to the great competitions of the day.

The president of the society was on hand everywhere, and in his place at all times.

The secretary was prompt at his post of duty, and, as well as the president, was attentive to the wants and comforts of the society's guests.

The society own a handsome plat of ground, which is well located, containing eleven acres.

On the outer part of this plat is a track for the exhibition of horses. So the fair ground is surrounded by the track, except a strip of land varying in width from perhaps one rod to four rods in width.

A fence, a post and one rail, runs the entire round between the track and the ground on which the exhibition is held. The stock on exhibition, as well as the people, are generally within the enclosure.

Here also is a small building called the "stand," to accommodate public speakers. In this building is a room for the accommodation of the secretary and the comfort of those who may be fortunate enough to gain admission on a rainy day, as was the second day of the exhibition.

On the grounds of the society are a number of pens, well-roofed and secure, for the comfort and safe-keeping of horses and other stock, not proper to be in less safe situations. There are also other pens used for well-disposed cattle, sheep and swine.

On an elevation, in front of the speakers' "stand," are seats like "turrets on a rising ground," sufficient to seat some five hundred persons.

There are no other accommodations on the fair ground, if we except a well of pure water, which was freely drunk, without making the drinker drunk.

The stock on exhibition was of superior quality, indicating that their home was in a hill country abounding in luxuriant herbage.

Stock on exhibition at other fairs spoke unmistakably of the drought of the season, and that of Franklin County came in for a hearing, but there were some noble specimens of the various breeds.

The Ayrshire, that well deserving race, took a high stand on that occasion, doing credit to the owners as well as to the exhibition.

The Kerry, black as a full-blood African, was allowed to be present, without an objection being raised by the most fastidious.

The Jersey, a very popular breed in some sections, and worthy to be kept by all butter-makers, was represented by a herd of some twenty, each with a bell attached to a strap, which passed around the animal's neck. They spent the time grazing together, like a flock of so many sheep, and were not disturbed by man or beast. This herd made a most beautiful appearance, and although not enclosed within the fair ground proper, were on exhibition, and were a power of great attraction.

The Shorthorns, a most noble race, came in for their share (which was not small) of commendation. The grades were there in large numbers.

No language could speak with greater emphasis in praise of the farmers in Franklin County than does the stock generally grown within its limits. If what was on exhibition was a fair specimen, it indicates a spirit of enterprise worthy to be imbibed by some of its neighbors.

The working oxen were most of them grades, large and generally well formed animals.

A string of thirty pairs, from the town of Deerfield, was very prominent in the exhibition.

There was no trial of skill, either of man or of beast, in the art of ploughing.

The trial of working oxen on the cart to a load of 3,960 lbs. was well nigh, and would have been an entire failure, had the spectators pressed a little harder and closed up the drive-way. An ox must have a free pass if you would have him show himself to advantage; and his driver ought not to be compelled to dodge among a crowd when guiding his team.

The trial of oxen and horses on the drag, to a load of 3,400 lbs., was good; the performance was well, but no doubt would have been much better if no obstruction had been in the way.

Much credit is due to the society for the arrangement for a load, both on the cart and the drag, which consists in having square blocks of stone, with the weight of each block marked on it, and an iron bolt with a ring by which to handle it. A load is made up with ease, and the material is always on hand.

In the opinion of your delegate, the society very much need a larger room than that they now occupy to accommodate their necessities. They are in ample funds to do all that is necessary in the way of building a hall, which would add greatly to their convenience in the display of fruit and other articles which should be favored with shelter. Then, too, they would have of their own a place for public gatherings, where addresses might be made, heard and understood, without the almost constant interruption by the brute creation, as was the case during the delivery of Rev. Mr. Moor's most admirable address. The address itself was worth the cost of a new building, and would be found so if people would heed its teachings on physical economy.

The society now occupy a hall centrally located in the village, in which to display their fruit, flowers, works of art, needle-work, field crops and vegetables.

The vintage gathered and exhibited was abundant,—grapes of every hue and name, in clusters far surpassing moderation, and in flavor most delicious, were exhibited.

One need only to be there to be convinced that the past had been a most favorable fruit season.

Truly, Franklin County had been highly favored with both fruit and vegetables, as the display evinced.

No further evidence was needed to prove that the ladies in this society take a deep and commendable interest in these county fairs, than was given on that occasion. They not only exhibited their own work, tastefully wrought and gracefully displayed, but they were there themselves, right where they should be, with their husbands, their brothers, and those for whom they had great regard.

These exhibitions are not for the benefit of the fathers and the sons exclusively, but for the good of all concerned. And is not the interest of the wife and the daughter in the art of agriculture and horticulture sufficient to warrant their attendance and participation on these festive occasions? It is commendable in them to do so, and it is praiseworthy that they present their own labors for the inspection of the public and the awards of the society.

On this occasion, the work of their hands was profusely displayed in great richness and surpassing beauty.

The society seems to be in a prosperous condition. The members are in full belief that they are engaged in a good cause, and are generally zealous therein.

Harmony in feeling and in action enables a community to accomplish wonders; and so does division and strife, but they are opposites.

THOMAS W. WARD.

BERKSHIRE.

The sixty-first anniversary of the Berkshire Agricultural Fair opened on the 4th of October, 1870. We confess to having great anticipations of seeing here the perfection of a cattle show.

The age of the society, its ample means and reputation, the fine pasturage of this region, the fact that it had not suffered as other parts of the State from the long continued dry weather, all conspired to create this expectation.

In the main, we were not disappointed. The grounds of the society are now extensive and beautiful. The scene presented on the opening of the fair was animating and exciting to the lover of the farm and its interests. Every one seemed interested and determined to make it a success. The good nature with which they met all inquiries concerning it, the attention of the officers, the large number of past officers present, all gave you the assurance of interest and prepared you for its success.

On examining the stock we found 132 head beside some four herds; 64 sheep beside some eight flocks; a score of swine of both sexes. We were disappointed in one point, viz., in thoroughbred Shorthorns.

We supposed this region excelled in the perfection of this breed. We found fine native cows, which we think led all other breeds for numbers. The Alderneys, Ayrshires, Holsteins and Shorthorns were well represented in the milking stock, but we think the latter were the smallest in number.

The working oxen were large animals, showing great power.

The fowls were fully represented in some thirty entries. If judged by the purpose of furnishing eggs or meat, this part of the show is seldom excelled.

There were also a large number of agricultural instruments here, as at other fairs.

We noticed four different instruments, invented and exhibited by one man, showing that Berkshire farmers are evidently using their brains to lighten and hasten the work of their hands.

The visit to the hall showed us very large quantities of bread and biscuit with their counterparts of golden butter and rich cheese. There is, as there should be, great competition for the premiums in this department. When the shows stimulate a large number to try for the prizes, we may be sure of their good effects. Let me then simply state that over one hundred wives and daughters of the Berkshire farmers presented bread and biscuit, some sixty put forth their butter, over fifty presented factory and family cheese, and one can see that the right ambition is aroused. Nor are fancy articles wanting.

As every where, this year the fruit was very extensive. The vegetables and seeds especially attracted our attention. The number of specimens was large, and the quality very fine. We consider the latter very important. As far as our observation goes, we think the growth of seeds too much neglected, and in this respect this exhibition deserves most hearty commendation. Henry S. Goodale had arranged most beautifully one hundred and fifty varieties of potatoes. Another exhibited twenty-four varieties. All of which at once begot the assurance, that the farmers and their wives and daughters, nay judges and artisans, were incited to that *care*, whose products will bless the State pecuniarily, physically and morally.

The second day, October 5th, opened for an exhibition of horses. We confess to little interest in raising horses for fancy purposes only. When, however, agricultural societies encourage the raising of fine animals for driving and work, it is perfectly legitimate to their aims. We think the society here are doing a good work. Their farm horses showed great power, excelled only by their long-trained draught animals. Rarely have we seen a finer stock of young horses; their form, style and gait bid fair to make Berkshire celebrated for the fine horses raised among her own hills.

The display of fine matched horses, raised or not raised in this region, must cultivate both taste and judgment in those engaged in this branch of agriculture, and lead us to look forward confidently to a time when this part of our fairs may be lifted above the demoralizing tendencies of the race-course and its accessories.

The third day, October 6th, was given the address of Hon. Levi Stockbridge of the Massachusetts Agricultural College, which has since been published in full by the society. Then came the novel feature of awarding and distributing silver plate as premiums, followed by the races.

To the above brief glance at this fair, we wish to add a conviction or two produced by it.

1st. That the State's encouragement has done and is doing much to bring up the agricultural interests of the State, and generally the annual grants from the treasury are well expended. I think this will hold true of this long established society, as seen by reference to the answers to questions put forth by this board and herewith returned.

2d. The societies generally need, and will be profited by, the continuance of this aid from the State.

The time is rapidly hastening when both economy and necessity will demand that we produce much more from our own soil. In fact, with fertilizers accumulating from abroad to enrich our lands, we shall be unfaithful to our opportunities, if we do not produce more and more food each year, for man and beast. Indeed we owe it to the increasing populations of the world,—to the ever increasing demand for bread. Let the State not refuse her aid when the duty is becoming more important and apparent to her people.

Since the fair we have received published documents from this society, showing their good working condition, and opening all their transactions to the public eye, not only to invite investigation, but also to offer to all interested in it the fullest information.

Wm. Knowlton.

HOOSAC VALLEY.

In obedience to the appointment of this Board, I attended the eleventh annual fair of the Hoosac Valley Agricultural Society, which was held at North Adams, on the twentieth, twenty-first and twenty-second of September.

A visit to the valley of the Hoosac cannot, under any circumstances, fail to be interesting and instructive. The Commonwealth has not within her limits a spot which displays more creditably the intelligence and enterprise of her people. A mountain lying across the traveller's path affords an opportunity for the exhibition of an engineering skill and indomitable energy, which are proceeding with unerring certainty to pierce the solid rock with a long avenue, through which the commerce of the east and west may pass. The waters of the turbulent mountain streams are made to supply the power for a variety of manufactures. Something of the superabundant labor of the old world is here made available.

The miner from Cornwall brings his energy and skill, and the Celestial Empire sends her children half around the world to contribute to these productive industries.

In the midst of such surroundings it is but natural to expect the farmers to conduct the business of the farm with a good deal of sagacity and vigor. The excellence of the display at the exhibition attended by your delegate certainly reflected much credit upon them. Of the show outside the hall, that of the cattle was large and of a superior quality. There were a few fine specimens of Jersey and Ayrshire stock, but the valuable cattle were to a great extent Durhams. There were some excellent sheep, both of the fine and coarse wool. There is much force in the suggestion made by the committee, that more attention should be paid by the farmers of this society, to the raising of coarse-wool sheep. The horses upon the grounds were numerous, and comprised not only the large, strong-limbed and muscular animal adapted to the heavy work of the farm, but also those more lightly moulded and fitted for hard work and long endurance on the road and for speed.

The exhibition within the hall was admirable. The departments most conspicuous in merit were those of the dairy and fruits. The society has occasion to congratulate itself on the fair of 1870. The general management of the society is evidently in faithful and competent hands.

Your delegate is indebted to officers and friends of the society for hospitality that was especially kind and courteous.

GEO. A. KING.

HOUSATONIC SOCIETY.

The annual exhibition of the Housatonic Agricultural Society was held at Great Barrington, September twenty-eighth, twenty-ninth and thirtieth. The exhibition in every branch was excellent, one leading feature of which was a large and interesting collection of crops of all descriptions. The entries of summer crops numbered 122, and consisted of wheat, rye, oats, barley, grass, and garden vegetables. The fall crops numbered 171, and consisted of sowed corn, corn, buckwheat, potatoes, beans, mangel wurzel, carrots, Swedish turnips and cabbages. All these crops were carefully examined by committees appointed for that purpose; and the value of the samples presented at the fair, was greatly enhanced by the statements which the committees were able to make with regard to the quality of the land on which they grew, and the modes of cultivation.

The products of the dairy were well represented. The forty-two samples of butter were of fine quality, and gave assurance that the farmers of Berkshire have lost none of their interest and skill in this most important branch of the domestic economy of the farm. The entries of cheese were seventeen in number, and the opinion that the farmers' wives had excelled in this production, and had surpassed the factories engaged in the same business, seemed to be very generally entertained. The example set by this society in this respect is worthy of imitation.

The exhibition in the hall, of fruits, flowers, domestic manufactures, implements, and articles of taste, was admirable and extensive.

Among the cattle, were to be found some fine fat oxen, and many pairs of well trained and well shaped working oxen and steers. The milch cows were of superior quality generally; and there were many specimens which in size, shape, condition and development could hardly be surpassed.

A valuable collection of horses was on the ground, and attracted great attention.

The importance of the proper breeding of these animals seems to be thoroughly understood by the farmers of this section. The committee on stallions and colts, have well remarked:

"A stallion before the public is either a curse or a great benefit to any locality where he happens to be in use, and it takes years to recover from the damaging effects of a poor stock horse; consequently, we must know beyond question the breeding and blood, for at least three generations of any stallion on both sides; and best of all his stock must and will prove whether he is worth the attention of breeders. Your committee would urge all owners of good, well-bred, sound breeding mares, 'as no other can breed a sound colt,' the importance of a judicious selection.

"We also believe that a stallion can and should combine qualities so as to produce, not only well developed, good-sized carriage and family horses, but have bone and muscle enough to draw the plough and light road-wagon. * * If one should show a little speed, we have yet to see the farmer that did not know it was worth something. But your committee would not recommend breeding for speed entirely; but a stallion—weight not less than 1,000 pounds, showing blood-like courage, head and neck fine and clean cut, fine skin, good disposition, strong, well muscled, clean limbs, large, strong barrel, powerful, strong back and quarters, good feet, a full long tail, good square trotting action, showing lasting qualities when driven at a high rate of speed. Your committee believe such a horse will produce good farm, carriage and family horses, and occasionally a trotter, taking your common breeding mares as a foundation."

These principles and suggestions applied to the general business of breeding would undoubtedly improve our animals and increase their usefulness and value.

The care taken by this society in regard to the pedigrees of animals entered for premium, is especially praiseworthy and should be observed throughout the Commonwealth.

The exercises of the occasion in the hall, consisting, mainly of an elaborate and scholarly address by President Clark, of the Agricultural College, upon the importance of professional and scientific education of our young men, were interesting and instructive.

Geo. B. Loring.

NORFOLK.

The twenty-second annual exhibition of the Norfolk Agricultural Society was held at Readville on the 22d and 23d of September, and I had the pleasure of visiting it.

Our brother delegate from that society met me at the depot and took me in his carriage, and I was landed safely within the walls of the society's grounds on the morning of the first day of the fair.

The weather was clear, but very dry and dusty.

The society has ample grounds, a very good track and excellent accommodation for horses, stock and products of the farm, &c. The first thing to attract attention, as per programme, was the ploughing match, which took place on the grounds outside of the enclosure. There were a goodly number of teams promptly on the ground, of all sizes; double and single teams of horses, also of oxen. As the ground was very dry and hard, it was well suited to test the power of the teams and skill of the ploughmen. The work as a whole was well done, and some of it very skilfully so.

After the ploughing came the drawing match, which was principally done with horses, and was a very good show. It was very evident that there was perfect confidence between the driver and his horse, and the work was well performed, without loud talk or the use of the whip.

The stock on exhibition looked very well for the season; no one could expect stock to look as well in a long continued dry season as in a growing, luxuriant one. The past season has been an exception, and it is our duty to make the best of it and press on; if we look about us we shall find that in all kinds of business and trades there are some *dry* seasons. But I noticed that there were but few competitors for the premiums. Much the largest part of the stock on the grounds was owned by one man. I am told that there are a large number of good cattle owned within the limits of the society. Then, farmers, why not bring out the best you have and get your share of the premiums, and make a good cattle show? Had not Mr. Eldridge, the president of the society, opened his gates and contributed to the show his fine herd of Jerseys, it would have looked lonely in the stock department.

There was but one lot of sheep on exhibition, those owned by Mr. Eldridge, and a very worthy flock they were. In swine there was more competition. The exhibition of poultry was very good, and would do credit to any society.

Of fruit there was a good exhibition of all kinds, but I was told it was not nearly so good as usual, as the great hail-storm of June 20th spoiled a very large amount of the crop in that section. But nothwithstanding the storm, Hon. Marshall P. Wilder presented one hundred and fifteen different varieties of pears, all choice; he also exhibited three plates of pears, which looked very nice, grown in California. There was also a plate of twelve Bartlett pears on exhibition by J. C. Bradley of Milton, especially nice. There was a large collection of grapes, which were very fine.

The exhibition of flowers was very good.

The products of the dairy were very small, but should judge them to be good.

The show of agricultural implements was very good; there were some improved machines.

Roots and vegetables not very plenty, probably on account of the drought.

The ladies' department was well represented.

The collection of manufactured articles was small. There were some very fine carriages on exhibition.

Some attention is given to breeding and raising of horses. I noticed some very good colts of all ages presented for premiums. The carriage and draught horses were very fine.

The exhibition of horses on the track seems to be the strongest feature of the show. There was a full attendance of anxious spectators on and around the grand stand each day.

Your delegate staid to witness but a small portion of the trotting, but has no doubt that they had a good time, as there was a large number of entries, good weather and good regulations.

There was an excellent dinner provided and served to as many gentlemen and ladies as desired, under a large pavilion. After dinner, Hon. M. P. Wilder gave an interesting account of his travels in California. Rev. E. P. Dyer of Shrewsbury read an original poem, which was very interesting. Also a fine band of music, a good police force and a chief marshal who knew and did his duty.

I will briefly add, that, in my opinion, if the exhibition of the Norfolk Society was not as good as in former years, there must be other causes than lack of effort and interest on the part of its officers and members who had the management of it. To make an agricultural exhibition useful, interesting and attractive, the coöperation of the farmers and producers with the officers is of the utmost importance. This society has been one of the first and foremost in agriculture and horticulture, and I see no reason why it may not continue on with its unbounded usefulness. I was informed that there had been two hundred and fifty new members added to the society the present year; this is certainly a good indication of prosperity.

In closing, I wish to express my thanks to the officers and to Col. Stone and lady for their hospitality and kindness, making my visit pleasant and profitable. JOHN T. ELLSWORTH.

BRISTOL CENTRAL.

As delegate from this Board, I attended the eleventh annual cattle show and fair of the Bristol Central Agricultural Society, at Myrick's, September twenty-first, twenty-second and twenty-third, 1870.

The grounds of this society containing about 40 acres enclosed, and conveniently near the railroad station, seem admirably adapted to the required purpose. They have a large and beautiful hall, also roomy and convenient stables, sheds and pens for the accommodation of horses, cattle, sheep and swine.

The weather was fine, the attendance large, and I am happy to remark that the best of order prevailed during my stay on the grounds.

The ploughing match at 10 o'clock the first day, was attended with much interest, and the ploughing well executed considering the dry and sandy character of the soil.

At 11½ there was a procession of town teams on the track, headed by the Fall River band. The team from Taunton was drawn by 32 yoke of oxen, and the one from Lakeville by 27. They were the only competitors.

The exhibition of neat stock was not large, though said to be the largest ever seen upon the grounds. Among the most noticeable, was a pair of fat oxen exhibited by Jonathan Slade, of Somerset. They were of the Durham breed, five years old, weighed five thousand pounds, and took the first premium at the New England Fair, at Manchester, New Hampshire.

William L. Slade, of Somerset, also exhibited a beautiful pair of fat oxen.

The representation of milch cows was very good, consisting mostly of Jerseys and grades from this and the Durham stock.

Several very fine Jersey and Ayrshire bulls were exhibited, indicating a lively spirit of improvement in breeding dairy stock. The society offer no premium on grade bulls, yet I could not learn that any pedigree was required.

The show of sheep and swine was not extensive, but that of poultry, including most of the modern fancy breeds, was the best I ever saw, and attracted much attention. A premium was offered for the best *coop* for exhibition purposes.

The morning of the second day was devoted to the display of horses on the track. Some excellent single and matched carriage horses were shown, but the *greater interest* seemed to be manifested in the *trotting* horse.

The show of breeding mares and colts, and young horses, was quite extensive, some of them very fine animals, indicating care and good judgment in this important branch of stock-raising.

The exhibition in the hall was very superior, almost every department being well represented; choice vegetables, and fruit of every variety, as well as beautiful flowers graced the tables.

On the afternoon of the second day General Butler delivered an address to a large and attentive audience. The subject was a comparison of the state of agriculture in this country, and in England and France.

At the close of the address a very happy and eloquent speech was made by Judge Russell, of Boston; also some very appropriate remarks by General Underwood, of Newton.

The society seems to be in a thriving condition, and supported by many zealous and intelligent farmers, yet much of its success is due to the liberality and untiring effort of their president, Dr. Durfee, to whom the thanks of your delegate are *especially* due for his kind and genial hospitality during the fair.

A. J. Bucklin.

HINGHAM.

The twelfth annual exhibition of the Hingham Agricultural Society was held at that place on Tuesday and Wednesday, September twenty-seventh and twenty-eighth.

From the long continued drought of the summer and autumn, it was hardly to be expected that any of the fairs in the State would be up to their usual standard, and I visited this society with the full expectation of finding it below its own average of exhibitions. But I am happy to say that I found it very full in all its departments and fine in quality. In the stock department the show was good, thoroughly interspersed with Jersey, except the oxen, and there I noticed but one pair of this breed. Fifty-two yoke of oxen were marshalled in one team, although not all from one town. We are accustomed to think, that for fine oxen we must look to the interior or western section of the State, and more to horses in the eastern. But we seldom see finer oxen than were in this team. The heaviest weighed nearly 4,000 pounds.

More fat oxen were on exhibition than I have usually seen at other fairs. Nearly one hundred hogs and pigs were noticed and many of them of superior quality, and largely of the Chester County breed. One fat hog of enormous size was exhibited by George R. Ripley.

Over a hundred sheep were noticed of the Leicester and Southdown breed, which shows that sheep are not entirely ruled out in Eastern Massachusetts. The ploughing match was contested by seven teams, all with drivers. The double teams ploughed ten inches, and the single teams eight inches deep. It was stubble ground and although ploughed very deep did not reach moisture, so that the ground could not be left as evenly as it otherwise would be.

The exhibition of horses was good. The driving was more particularly to show the horses, their docility and movements, without regard to speed. The draft horses showed power and careful training. The trial of working oxen was excellent, on a load of over 4,000 pounds besides the wagon. The test was by starting the load over four-inch scantling, placed in front of the wheels, which showed the training of the oxen to a steady and heavy draft.

In the poultry department were one hundred splendid white ducks, exhibited by the President of the Society, Hon. Albert Fearing. In the hall the show was unusually full, and showed no traces of the drought. Apples were abundant, 367 plates and of superior quality. Also, 348 plates of pears of all the standard varieties, showing the interest in fruit-growing in this section of the State. There were thirty-one entries of bread, five of which were by misses not over fourteen years of age. This is an interesting feature in the exhibition, showing that the young ladies are being trained in the art of cookery.

There were beans, rye, barley, potatoes, tomatoes, beets, mangolds, onions, corn,—a splendid exhibition,—watermelons, sweet potatoes, a fine collection of squashes and muskmelons, carrots, that looked as if they had penetrated deeply for moisture and nourishment, and found it. Pumpkins and grapes were seen in large quantities, the grapes looking very finely. In fact without enumerating further, I can say the exhibition in the hall and outside was one that the society might well be proud of.

The members of the society and others to the number of over five hundred entered the spacious hall and partook of a sumptuous dinner, after which there were speeches by the President of the Society, Hon. Albert Fearing, His Excellency Governor Claflin, Governor Stearns, of New Hampshire, Hon. Thomas Russell, Hon. Oliver Warner, Colonel Wilder and others. Also, there was a poem by Rev. E. P. Dyer, of Shrewsbury.

After dinner and the intellectual feast in the hall, your delegate left with many pleasant recollections of his vist in Hingham and the kind attentions of the president and other officers of the society, and feeling that this society is doing much to promote the interests of agriculture in this section of the State.

N. S. HUBBARD.

MARSHFIELD.

As delegate from the State Board of Agriculture I attended the annual exhibition of this society held at Marshfield October 6th, 7th and 8th. The weather the first day was very unfavorable and the attendance was not large, but this was more than made up on the 7th which was the principal day of the exhibition. With a full knowledge of what the season had been I went down to Marshfield not expecting to find a very good exhibition, but in some departments I was happily disappointed. The show of stock in the pens was not large, but some of the animals were good. The swine were not largely represented. There were some fine fowls, including some splendid geese; of horses and colts we saw but few. The ploughing match attracted a good deal of attention, though the weather was not favorable. The ground ploughed was light, almost sandy with but a tender sward, and not altogether a good place to show the best results, however skilful the guiding hand might be. The work was creditably performed. There was what is called the "town team," embracing 112 yoke of oxen, that would do credit to any owners, in any town or county. The great attraction to many was within the walls of the fine building, of which this society is the fortunate owner. Of apples, pears and other fruits there was a large and fine display, one that would do credit to older societies.

The display of vegetables was extensive and very fine, fully equal in some respects to any we saw the past season. The squashes and sweet potatoes attracted much attention from their superior size and excellence.

In the department of jellies and preserves, there was a large and excellent exhibition, and the same may be said of bread, butter and cheese; of the bread and butter we can truly say that we have seldom seen a more extensive show, or samples of better quality, which speaks well for the housekeepers of this county. The handiwork of the ladies was visible on all sides, fully attesting the taste, industry and thrift of the better halves and the fair daughters of the members of this society.

The dinner, with the intellectual repast that followed, was all that could be desired. The members of this society have reason to be greatly encouraged when they remember the success of their last exhibition in spite of drought and all the other obstacles with which the farmer must contend. The grounds with the large and admirable building owned by this society are well arranged for the purposes for which they are designed, and we hope may long be enjoyed by those who have labored to bring this young society to its present high rank.

J. F. C. Hyde.

NANTUCKET.

At the meeting of the Board at Amherst in August, I made arrangements with Mr. Thompson to meet him in Boston on Tuesday morning, the 27th September, at 8 o'clock, A. M., to take the cars for Nantucket, and was disappointed in not finding him there, and did not learn of his sickness until I arrived at the island. I was met at the boat by one of the vice-presidents, William H. Waitt, Esq., who accompanied me to the hotel where I found a pleasant home. The town was all alive in preparing for the show the next day. The weather of the 28th was all that one could wish. I started early for the fair ground, which is a mile distant from the centre. The society own twenty-one acres of handsome level land, surrounded with a substantial fence, and having a smoothly finished track and ample stands for the committees and the band. There is a large number of stanchions and hitching posts where the cattle are all secured, and where the committees have a fine chance to view them. There were 215 head of cattle on exhibition. Of these, 142 were cows, seventeen were thoroughbreds, sixty-one grades and sixty-four natives; the largest and best show of cows I ever saw. The thoroughbreds and grades were mostly Alderneys and Ayrshires; there were four full-blood Durhams, very good animals. There were ten bulls, excellent types of their breed, as they offer no premium except to thoroughbred bulls. There were eleven yoke of oxen on exhibition, and some fine young stock. The show of sheep was good, mostly Southdown. There were but few swine, good specimens of the Chester White. The exhibition of poultry was large. All breeds were represented; I noticed a number of coops of native and China geese, ducks and turkeys.

At two o'clock the ploughing match was contested by five single teams, two ox and three horse teams, on the society grounds, which is a sandy loam, which was well done. The fine weather, large display of stock, enlivening amusement and music, with the large company assembled at the grounds, rendered the fair a success.

At the hall in the evening, they held a social gathering. The opening address of welcome was made by the vice-president, William H. Waitt, Esq. We had speeches from other gentlemen, music from the glee club and band, and the evening passed off very pleasantly. In the hall the exhibition was very fine. There were many articles of curiosity, interest and taste, beside the fruits and vegetables, of which there was a splendid show. There was fine bread and about 100 lbs. of good butter on exhibition. I have never seen better pears, and never so good grapes as were here exhibited in large quantities. I think Nantucket can beat the world in raising pears, grapes and vegetables, and I think, with the facilities which they have for enriching their soil, that they might make farming profitable.

At nine o'clock the second day, the examination of horses came off. Among the breeding stock, were some fine mares, with colts by their sides. Several fine family horses were driven around the track, showing action and some speed.

In closing my report, I with pleasure mention the cordial reception I received as the delegate of the State Board from the acting president, William H. Waitt, Esq., and the secretary, Alexander Macy, Jr., and others, and those kind attentions shown me during my stay rendered my visit to that society very pleasant.

John A. Morton.

MARTHA'S VINEYARD.

The thirteenth annual exhibition and fair of the Martha's Vineyard Agricultural Society, was held at West Tisbury, October eighteenth, nineteenth and twentieth.

Leaving New Bedford, I passed over a rough and boisterous sea, giving me, an inland farmer, to say the least, plenty of sea experience, all of which was dispelled, on arriving at Holmes' Hole, and meeting there the worthy secretary of the society, David Mayhew, who was waiting to convey the orator of the year, Dr. Geo. B. Loring, and myself, to the then attractive feature of the island,—the annual farmers' holiday. I found it this in a true sense. On arriving at the society's grounds the crowd in attendance first drew my attention, as it seemed to me composed wholly of farmers and their families. The day being well advanced, and the hour being near allowing the removal of neat stock, I was conducted about the grounds that I might see this fine display of cattle, a total in number of two hundred and forty-nine (249) head, consisting of natives, grade Ayrshires, and thoroughbred Ayrshires. The display of oxen and steers, (75) seventy-five yoke, was commendable, but not what it should be viewing it in comparison with the excellent display of bulls and cows, from which one would infer fine steers might be reared, and as proved in the oxen and steers shown by H. D. Norton, Herman Vincent and Stephen Luce.

The bulls I found all thoroughbred Ayrshires, eight in number, and with pleasure I report that this society offer no premiums on grade bulls. Well worthy of standing prominent among the bulls two years and over, was McDonald 3d, shown by Captain F. O. Rotch, while in the yearlings, the one shown by Allen Tilton gives promise in the future. The display of cows and heifers, as before expressed, was excellent, and consisted of thoroughbred Ayrshires, and high grades of the same breed, thirty-one being shown in the various divisions, aside from the class "herds of cows," of which there were five entries. F. O. Rotch led in both the show of cows and heifers. My attention was next called to the sheep, of which I found on exhibition seventy-six (76), consisting in the main of what is termed natives, and I think I can say nothing better in reference to this class of farm stock, than to refer to the report of the committee, in which is urged on the mind of the farmer the importance of obtaining pure-bred animals to breed from, but ending in these words, "It is useless to purchase fine sheep, with the expectation that they or their offspring will prove satisfactory unless properly cared for," referring, I think, to the practice on the island of letting the sheep run at large most of the year.

I observed, next the sheep, three pens of swine, the total on show, and near by was the fine display of poultry, fourteen coops, consisting of hens, guinea-hens, turkeys, geese and ducks. Viewing these, I neared the hall, which, on entering I found full to overflowing, of the productions of the farm, the garden, the orchard, the workshop, and the many fancy and domestic articles the farmers' wives and daughters everywhere know so well how to manufacture.

The long tables of fruit first met my eye, embracing apples, pears, peaches, grapes, quinces and cranberries, in a total two hundred and thirty-six (236) plates; Mrs. Shubal Smith, of Holmes' Hole contributing the largest display, twenty-eight of pears, fourteen of grapes, two of quinces and ten of apples, among which was shown "The Smith Seedling," a seedling from the R. I. Greening, very large, and, as I was informed, with all the qualities of the parent apples, adding thereto keeping qualities equal to the Roxbury Russet, the tree being very hardy where other of our standard New England varieties will not thrive. The tables of vegetables were more than full, the potatoes being legion. One would have good reason to judge from the display that the people here had the fever to the highest point, all the new and fancy varieties, as well as the old being shown. Beets, onions, turnips, cabbages, huge pumpkins, and mammoth squashes, the product from six hills being fifteen hundred pounds, tempting watermelons, all had their allotted places. Of the grains I found fifty-seven samples, corn predominating.

The dairy was represented by fifteen samples of golden butter and three samples of cheese. Added to this the culinary show, of forty-three loaves of bread and cake, made a tempting table to look upon. Preserves and canned fruits were shown in large quantities. With these, I saw twelve specimens of wines. Not sampling, can only say, "distance lent enchantment to the view." The handy workmanship of the wives, and daughters, occupied a large space in the display of domestic and fancy articles. Plants and flowers, though late in the season, added much to adorn and beautify the hall. E. T. Dunham was on hand with his sample of Sicily nut-tree, extolling its merits highly, and informing all that he had "but a few more for sale;" "purchase while you can" was his continual advice. Painting and drawing covered one end of the hall, and in conspicuous position, as well they should be, on account of merit, were the copied pictures by J. H. Nickerson, an infirm boy, whose practice had been his only teacher. Agricultural implements were represented by one each of Buckeye mower, Bay State rake, and ox yoke, added to these the mechanical implements, and manufactures, as shown in wagon, household furniture, leather, brick and tile, &c., closed my inspection of the hall, and brought me to the second day of the exhibition, which was devoted to ploughing match, and horses.

The premium for ploughing was contested for by three ox teams, on a fine loam soil, and was skilfully executed, the first premium being taken by the person who had taken the same at several past exhibitions. I would suggest to the farmers of the society, that they in future seek a little harder for the honors of this department of the show, or else "throw up the sponge," and accept the present winner as the champion ploughman of the island. Next in order of the day came the colts, mostly of the Messenger stock, the get of the stallion Hiram Morton, purchased in Maine, and owned by Hiram Smith. They all appeared well, and if properly cared for I have no doubt will make good farm horses. The farm and driving horses were shown off the society's grounds, on the track owned by the Hon. H. L. Whiting, a total in number of thirty-five (35); am pleased to report there was no racing, all the horses being shown at their natural motion. This being the actual closing of the fair, I wondered if the third day could be well sustained, but to my surprise, in spite of the rain and wind, at an early hour the crowd began to gather, to view the hall, and in the P. M., to hear the true closing feature of the show, the annual address, by the able agricultural orator, Dr. Geo. B. Loring, who was, as ever, interesting and instructive, and was throughout listened to with the closest attention.

From all I saw on the island, from the statement of the corn crops, etc., raised here,—one acre of corn raised the past season, by Mr. Geo. D. Cottle, the yield estimated by a portion weighed, was one hundred and twenty-seven and one-seventh ($127\frac{1}{7}$) bushels, fifty loads of manure only being applied, all ploughed under,—and from the high tone of morals that prevades the entire community (for in the three days' mingling among the people I did not hear a profane word), intoxicating liquors, or persons intoxicated not being seen, and I was informed that liquor could not be purchased on the island, as it were starving out Major Jones and his assistants; and after acknowledging the courtesy and hospitality extended me by the officers of the society, and many others, especially the kind family under whose roof I found so good a home, will only say, that in my estimation Martha in this vineyard made a good choice.

E. W. Boise.

HAMPDEN.

Agreeably to appointment, I attended the exhibition of the Hampden County Agricultural Society, on the 4th and 5th of October. The morning of the first day was unpleasant but it cleared off at noon, succeeded by a pleasant afternoon. Notwithstanding the unpropitious morning, which, in some measure, restrained the exhibition, there was a fine show of cattle on the grounds. Thoroughbred and grade Shorthorns were the most numerous. Next came the Ayrshires, then the Jerseys, with here and there a solitary animal of other breeds. The cattle were in very good condition, considering the drought of the season, embracing many superior animals.

Phineas Stedman, president of the society presented his fine herd of Shorthorns, headed by the "Princess Bull," "Duke of Carlisle," renowned for his excellence. N. T. Smith of West Springfield, exhibited 28 head of cattle, including his fine bull, "Vicksburg," including grade and thoroughbred Shorthorns, Josiah Fogg, of South Deerfield, exhibited a remarkably fine herd of thoroughbred Shorthorns, whose gratuitous presence added much to the show. This stock is from the royal line of "Arabella." One of his cows, 19 yrs. old, is her last calf. These are all bred as milking stock. His magnificent bull, "Master Buttercup," is from the line of stock of Mr. Sheldon of New York, who has recently been offered $10,000 apiece for some of his cows. W. R. Sessions, of Wilbraham, exhibited 17 head of Shorthorns and grades, among which was his admirable thoroughbred bull "Waterloo." In the line of Ayrshires was the exhibition of William Birnie's celebrated herd of thirty-six head, marshalled by his famous bull "Sultan," a herd of Ayrshires not to be surpassed by any other exhibition in New England. Among others we would name, as worthy of notice, Col. Thompson's herd of Grade Shorthorns; M. C. Graves' herd of Shorthorns, embracing a cow giving 40 lbs. of milk daily; H. C. Sherman of Chicopee; Hezekiah Pease, of East Longmeadow, of good Grades.

The exhibition of working oxen was not large, but among them some fine yokes. Of fat cattle, there was a splendid exhibition, by Charles Fowler of Westfield, consisting of seven yoke of grade Durhams; Seth Bush, of Westfield, also had some good fat cattle. The show of swine, sheep and poultry, was not large, and although each department had some good specimens there were few of which we took note. There was a fine show of agricultural implements on the ground consisting of ploughs, mowers, and other implements connected with agricultural labor. We arrived too late to witness the ploughing match, but understood the scene was very interesting and the work well done. The exhibition of vegetables, fruits, &c., was interesting though not so extensive as usual, probably owing to the character of the season. Mr. N. T. Smith, of West Springfield, was an extensive contributor. He contributed 68 varieties of apples and 19 of pears, besides grapes. John W. Adams, had a good show of various fruits. A. D. Briggs, some fine pears; J. G. Chase, some extra apples, among which we noticed the Congress; W. R. Sessions, of Wilbraham, had a fine show of apples. There were some fine Duchess D'Angouleme pears. There were a few fine peaches, but neither these nor grapes were as abundant as usual. Of vegetables, Mr. N. T. Smith showed more than 100 kinds, of which the potatoe figured largely in variety the Early Rose, and Jersey Peach Blow, with some of the newer sorts were very fine. Mr. George A. Kibbe showed 11 squashes from one vine, weighing 830 lbs.; one weighed 109 lbs. H. C. Sherman showed one weighing 108. C. C. Thompson, of Middlefield, Ferre, Batchelder & Co., fine shows of potatoes, including seedlings. The dairy products were limited. Of cheeses, there were three from E. W. Boise, of Blandford, handsome; and samples from a lot of sixty, by Miss Ladd, 14 years of age, of South Wilbraham. There were a few lots of very fine butter. Of mechanical and miscellaneous articles there was a good display, both connected with husbandry and housewifery, and with the attendance of a band of music, the hall attracted its usual patronage.

The address was delivered on the grand stand of the exhibition grounds. This was by Rev. J. F. Moors, of Greenfield. It was able and sensible; it consisted in contrasting the old with the new world. He believed that in public schools, social equality and progressive civilization, we have the elements of true life beyond any other country. That man, who has to make himself, has far better advantages here than elsewhere. He enlarged upon the bad character of our roads, stating the fact that the poorest road in Europe, is better than the best one in Massachusetts. He alluded forcibly to the faults in our buildings, the lack of ventilation, the the neglect of drains, &c., the importance of free air and exercise, to the more frequent usage of women in out-of-door employments, and in general to a greater simplicity in the habits of living.

The exhibition closed with the usual trials of horses in the various departments of draft, work, road and family horses. There was also an exhibition of the Percheron horses and colts to which premiums were awarded, by the Massachusetts Society for the Promotion of Agriculture; but our time did not permit us to be present.

The usual dinner was given at the Massassoit House, where the president, and other gentlemen, addressed the audience. In response to a call from your delegate, he alluded to the promising condition of the Hampden Society, under the guidance of an able and experienced head, to the magnificent grounds in possession of the society, that valuable as they were for an agricultural exhibition, they were still more valuable in a sanitary point of view, as a park for the city of Springfield, destined as it is to become one of the largest cities of the Commonwealth; that now while the opportunity exists that great boon, for the benefit of coming generations, might be secured.

Marshall P. Wilder.

FINANCES OF THE SOCIETIES

SOCIETIES.	Amount receiv'd from the Commonwealth.	Income fr'm permanent fund.	New members & donations.	All other sources.	Receipts for the year.	Prems. offered.	Prem's and gratuities paid.	Current expen's for the year—not including premiums and gratuities.	Disbursem'ts for the year.	Indebtedness.	Value of real estate.	Value of personal property.	Permanent fund.
Massachusetts, .	-	$4,441 05	-	$3,836 30	$8,280 35	$1,950 00	$1,450 00	$3,359 44	$4,809 44	-	-	$56,500 00	$56,500 00
Essex, . . .	$600 00	1,155 02	$281 00	1,611 44	3,647 46	2,112 50	769 50	2,286 52	3,055 52	-	$8,000 00	14,066 00	21,066 00
Middlesex, . .	600 00	-	853 00	2,120 16	3,573 16	2,056 00	1,561 75	1,578 19	3,139 94	$14,000 00	22,000 00	1,000 00	9,000 00
Middlesex North, .	327 25	-	131 00	2,550 55	3,008 80	1,043 00	670 75	1,805 14	2,775 89	2,700 00	13,500 00	300 00	10,800 00
Middlesex South, .	600 00	-	115 00	4,259 95	4,939 95	2,080 00	965 27	2,321 62	5,439 95	13,000 00	17,000 00	-	4,000 00
Worcester, . .	600 00	-	125 00	4,833 05	4,958 05	2,295 75	1,659 29	3,050 75	4,709 96	28,500 00	60,000 00	600 00	31,500 00
Worcester West, .	600 00	200 00	42 00	2,423 05	3,265 05	1,867 25	1,111 57	1,158 71	2,874 83	4,979 00	14,650 00	1,002 22	9,671 00
Worcester North, .	600 00	-	140 00	2,088 31	2,828 31	2,441 25	1,607 25	1,441 52	3,018 77	8,000 00	16,000 00	850 00	9,850 00
Worcester N. West,	600 00	-	551 50	5,389 53	6,511 03	1,422 50	944 25	1,157 08	6,745 43	12,740 00	15,300 00	1,450 00	4,010 00
Worcester South, .	600 00	2,131 73	144 00	1,738 66	4,614 39	1,196 50	748 25	2,265 91	4,037 91	7,459 00	12,505 30	1,450 59	7,255 89
Worcester S. East, .	600 00	43 00	80 00	753 28	1,476 28	1,348 75	646 20	737 88	1,381 08	4,500 00	8,500 00	1,000 00	5,000 00
Hampshire, Franklin and Hampden,	600 00	106 65	371 00	2,291 85	3,369 50	1,054 75	1,083 09	2,190 85	3,273 94	786 59	8,000 00	1,000 00	9,000 00
Hampshire, . .	600 00	700 95	80 00	199 34	1,555 29	841 75	611 95	826 36	1,438 30	400 00	5,900 00	550 00	6,450 00
Highland, . .	600 00	108 15	14 00	473 16	1,195 31	819 75	600 15	553 59	1,195 31	34 59	3,000 00	1,800 00	4,800 00
Hampden, . .	193 50	-	37 50	1,384 76	1,615 76	2,103 75	628 75	2,842 29	3,471 01	23,400 00	35,000 00	-	11,600 00
Hampden East, .	303 00	144 42	126 87	99 30	1,256 70	1,042 50	831 23	354 48	1,230 89	1,084 74	7,000 00	300 00	4,500 00
Union, . . .	196 75	-	163 25	1,690 60	2,050 60	600 00	427 84	1,605 61	2,033 45	1,940 00	4,515 75	400 00	2,975 75

Franklin,	$600 00	$120 00	$210 00	$1,075 57	$2,009 57	$1,348 75	$961 75	$1,400 95	$2,308 70	-	$7,000 00	$1,900 00	$8,900 00
Housatonic,	600 00	-	195 00	4,311 00	5,006 00	2,509 00	1,743 00	3,690 00	5,250 00	-	8,000 00	50 00	8,000 00
Berkshire,	600 00	625 00	256 00	3,194 48	4,675 48	3,250 50	2,759 50	3,537 41	6,296 91	-	12,000 00	1,500 00	13,500 00
Hoosac Valley,	600 00	60 00	629 00	3,707 46	4,996 46	1,519 00	1,259 75	2,272 82	5,222 67	$3,332 00	9,000 00	425 00	5,668 00
Norfolk,	600 00	-	141 00	3,706 67	4,417 67	2,173 00	1,356 00	3,018 17	4,374 17	18,300 00	25,000 00	350 00	7,000 00
Bristol,	600 00	-	165 00	8,069 21	8,834 21	3,700 00	3,049 75	14,700 99	17,750 74	9,038 18	35,000 00	300 00	26,261 82
Bristol Central,	600 00	-	1,164 00	4,678 74	6,442 74	3,752 00	2,615 00	2,149 48	4,793 23	5,816 00	20,000 00	500 00	14,684 00
Plymouth,	600 00	300 87	318 00	9,912 70	11,132 57	2,903 00	2,310 10	6,706 05	10,991 20	750 00	25,000 00	1,000 00	25,250 00
Marshfield,	418 61	-	557 00	6,714 62	7,690 73	1,100 00	645 13	1,615 66	7,426 59	6,196 41	11,215 05	706 33	5,724 97
Hingham,	600 00	-	1,114 46	4,050 84	5,525 30	1,610 85	1,128 02	4,448 25	5,576 27	7,000 00	31,480 59	3,431 05	24,480 59
Barnstable,	569 18	27 00	220 00	595 86	1,412 04	841 00	587 55	849 52	1,437 07	1,025 03	6,000 00	300 00	5,300 00
Nantucket,	559 00	125 00	5 00	-	768 00	975 75	509 50	333 50	843 00	100 00	3,000 00	200 00	3,000 00
Martha's Vineyard,	600 00	667 95	264 75	70 00	1,157 53	827 50	690 06	576 76	1,486 82	50 00	3,477 00	3,250 65	6,727 65
Totals,	$15,767 29	$10,959 79	$8,494 33	$87,826 54	$122,274 31	$52,786 40	$36,171 35	$74,805 50	$128,392 03	$175,331 54	$447,043 69	$96,181 84	$361,475 67

PERMANENT FUND—HOW INVESTED.

MASSACHUSETTS.—In Boston banks, Life Office, Boston city bonds, U. S. bonds.
ESSEX.—In bank stock, railroad bonds, U. S. bonds and real estate.
MIDDLESEX.—In real estate and exhibition hall.
MIDDLESEX NORTH.—In land, buildings and personal property.
MIDDLESEX S.—In society's grounds, track, buildings, horse stalls, sheds and pens.
WORCESTER.—In real estate.
WORCESTER WEST.—In real estate and fixtures.
WORCESTER NORTH.—In grounds and fixtures.
WORCESTER NORTH-WEST.—In grounds and buildings and personal property.
WORCESTER SOUTH.—In land, hall and track, furniture in hall, pens, fixtures, insurance policy.
WORCESTER SOUTH-EAST.—In hall and fixtures, stock, pens, &c.
HAMPSHIRE, FRANKLIN AND HAMPDEN.—In fair grounds and hall, and $450 in bonds and mortgages.
HAMPSHIRE.—In hall and grounds.
HIGHLAND.—In savings bank, U. S. bonds, and mortgage on real estate.
HAMPDEN.—In Hampden Park and buildings.
HAMPDEN EAST.—In real estate, cattle, pens and fixtures.
UNION.—In real estate and personal, consisting of hall, track and furniture.
FRANKLIN.—In ten shares bank stock and deposit in Greenfield Savings Bank.
HOUSATONIC.—In real estate and notes of members.
BERKSHIRE.—In real estate.
HOOSAC VALLEY.—In real estate.
NORFOLK.—In real estate occupied by the society.
BRISTOL.—In land, buildings and personal property.
BRISTOL CENTRAL.—In real estate, farm and buildings, with appurtenances.
PLYMOUTH.—In real estate, fixtures and furniture for use at exhibition.
MARSHFIELD.—In land and buildings and hall furniture.
HINGHAM.—In hall and grounds.
BARNSTABLE.—In land and buildings.
NANTUCKET.—In real estate, office and fixtures.
MARTHA'S VINEYARD.—In real estate and secured notes.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED.

FARMS.

SOCIETIES.	For managem't of farms.	For experiments in draining.	For subsoiling.	For ploughing at the exhibition.	For reclaiming swamp lands.	For experiments with manures.	For spading.	For hedges and ornamental trees.	For reclaiming old pastures.	For orchards of all kinds.	For cranberries.	For other farm improvements.	Total amount offered for farm improvements.	Total am't awarded for farm improvements.	Total am't actually paid for farm improvements.
Massachusetts,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Essex,	-	$15 00	-	$103 00	-	-	-	-	-	-	-	-	$378 00	$118 00	$103 00
Middlesex,	-	-	-	74 00	-	-	-	-	-	-	-	$70 00	339 00	144 00	144 00
Middlesex North,	-	-	-	40 00	-	-	-	-	-	-	$8 00	-	111 00	48 00	44 00
Middlesex South,	-	-	-	44 00	-	-	-	-	-	-	-	-	200 00	44 00	44 00
Worcester,	-	-	-	60 00	-	-	-	-	-	-	-	-	60 00	60 00	-
Worcester West,	-	-	-	55 00	-	-	-	-	-	-	-	-	129 00	55 00	55 00
Worcester North,	-	-	-	49 00	-	-	-	-	-	$10 00	-	-	240 00	59 00	44 00
Worcester North-West,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Worcester South,	-	-	-	69 00	-	-	-	-	-	-	-	-	176 00	69 00	69 00
Worcester South-East,	-	-	-	89 00	$8 00	-	-	-	$10 00	-	-	-	222 00	107 00	86 20
Hamps., Franklin & Hampd.,	-	-	-	-	-	-	-	-	-	-	-	-	23 00	-	-
Hampshire,	-	-	-	-	-	-	-	-	-	-	-	-	-	131 00	-
Highland,	-	-	-	-	-	-	-	-	-	6 00	-	-	33 00	6 00	6 00
Hampden,	-	-	-	16 00	-	-	-	-	-	-	-	-	148 00	16 00	16 00

Hampden East, . . .	$5 00	-	-	$18 00	-	-	-	-	-	-	-	-	$159 00	$23 00	$18 50
Union, ...	3 00	-	-	-	-	-	-	-	$5 00	$3 00	$1 50	-	20 50	12 50	12 50
Franklin, ...	-	-	-	-	-	-	-	-	-	-	-	-	53 00	-	-
Housatonic, ...	30 00	-	-	35 00	-	-	-	-	-	-	1 00	$18 00	160 00	84 00	84 00
Berkshire, ...	50 00	-	-	40 00	$10 00	-	-	-	-	36 00	-	53 00	-	189 00	189 00
Hoosac Valley, ...	-	-	-	-	-	$14 00	-	-	-	15 00	-	-	41 00	14 00	14 00
Norfolk, ...	-	-	-	100 00	-	-	-	-	-	-	-	-	334 00	100 00	87 00
Bristol, ...	-	-	-	162 00	-	-	-	$26 00	-	-	20 00	-	232 00	208 00	-
Bristol Central, . . .	-	-	-	42 00	-	-	-	-	-	-	5 00	-	111 00	47 00	47 00
Plymouth, ...	-	-	-	74 00	30 00	-	-	-	12 00	-	25 00	60 00	260 00	201 00	201 00
Marshfield, ...	-	-	-	27 00	-	-	-	-	-	-	4 50	-	136 50	31 50	31 50
Hingham, ...	-	-	-	32 00	-	-	$9 00	-	-	-	-	-	236 00	41 00	41 00
Barnstable, ...	-	-	-	13 00	-	-	-	-	-	5 00	8 00	-	110 00	26 00	26 00
Nantucket, ...	-	-	-	15 00	-	-	-	-	-	-	-	-	-	15 00	15 00
Martha's Vineyard, . . .	-	-	-	10 00	-	4 00	-	-	-	-	7 50	-	63 00	21 50	21 50
Totals, ...	$88 00	$15 00	-	$1,167 00	$48 00	$18 00	$9 00	$26 00	$27 00	$75 00	$80 50	$201 00	$3,974 00	$1,873 50	$1,399 20

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED—Continued.

FARM STOCK.

SOCIETIES.	For Bulls.	For Milch Cows.	For Heifers.	For Calves.	For Working Oxen.	For Steers.	For Fat Cattle.	For Horses.	For Sheep.	For Swine.	For Poultry.	All other Stock.	Total amount offered for Live Stock.	Total amount awarded for Live Stock.	Total amount paid out for Live Stock.
Massachusetts,	-	-	-	-	-	-	-	-	$450 00	-	-	-	$450 00	$450 00	$450 00
Essex,	$40 00	$30 00	$58 00	-	$30 00	$9 00	$187 00	$22 00	31 00	$32 00	-	-	664 00	439 00	405 00
Middlesex,	43 00	81 00	55 00	$16 00	-	-	8 00	*199 00	-	57 00	$71 00	†$100 00	821 00	630 00	630 00
Middlesex North,	28 00	40 00	21 00	9 00	36 00	12 00	12 00	234 00	15 00	23 00	39 00	64 00	637 00	532 00	347 00
Middlesex South,	15 00	61 00	13 00	25 00	25 00	-	-	552 00	19 25	25 00	145 00	15 00	1,240 00	895 20	815 20
Worcester,	67 00	119 00	46 00	9 00	126 00	28 00	18 00	1,046 00	29 00	42 00	16 00	-	2,036 00	1,661 00	1,579 82
Worcester West,	63 00	69 00	21 00	23 00	60 00	58 00	51 00	691 00	16 00	31 00	20 00	24 00	1,330 00	1,130 00	1,109 00
Worcester North,	66 00	44 00	42 00	74 00	38 00	38 00	23 00	752 00	12 00	34 00	16 00	106 00	1,487 00	1,245 00	1,172 00
Worcester N. West,	22 00	33 00	23 00	10 00	12 00	20 00	-	636 00	18 00	19 00	11 00	†10 00	1,157 00	814 00	755 67
Worcester South,	21 00	18 00	18 00	18 00	54 00	31 00	13 00	257 00	21 00	17 00	7 00	68 25	726 50	543 25	543 25
Worcester S. East,	8 00	34 00	25 00	14 00	55 00	29 00	8 00	138 00	14 00	32 00	8 00	52 00	507 00	417 00	342 60
Hampshire, Franklin and Hampden,	102 00	50 00	44 00	-	137 00	16 00	83 00	222 00	59 00	21 00	9 00	123 00	712 50	866 00	930 34
Hampshire,	22 00	10 00	9 00	10 00	34 00	8 50	16 00	130 00	25 00	20 00	10 00	58 00	378 00	352 50	343 60
Highland,	15 00	16 00	17 50	5 75	39 00	22 50	23 00	111 00	60 00	8 00	2 25	60 00	508 25	380 00	380 00

Hampden, . .	$52 00	$26 00	$53 00	$11 00	$64 00	$25 00	$27 00	$107 00	$14 00	$32 00	$30 00	$68 00	$923 00	$509 00	$456 00
Hampden East, .	67 50	21 00	33 00	22 00	60 00	49 00	34 00	155 00	17 00	24 00	19 50	16 00	627 00	518 00	441 50
Union, . . .	9 50	13 50	10 75	2 50	29 00	18 75	9 00	157 00	6 00	4 00	5 00	24 50	370 00	289 50	280 50
Franklin, . . .	72 00	102 00	12 00	18 00	42 00	62 00	18 00	178 00	69 00	22 00	14 50	55 00	837 50	664 50	632 50
Housatonic, . .	42 00	45 00	40 00	15 00	33 00	66 00	27 00	181 00	68 00	32 00	40 00	28 00	812 00	617 00	617 00
Berkshire, . .	70 00	67 00	52 00	22 00	36 00	38 00	38 00	642 00	89 00	46 00	51 50	120 00	-	1,271 50	1,263 50
Hoosac Valley, .	19 00	32 00	11 00	3 00	35 00	19 00	17 00	160 00	88 00	15 00	29 00	25 00	600 00	453 00	453 00
Norfolk, . . .	13 00	28 00	14 00	-	12 00	-	-	804 00	23 00	40 00	93 00	-	1,282 00	1,027 00	930 00
Bristol, . . .	138 00	90 00	53 00	68 00	166 00	62 00	112 00	168 00	46 00	50 00	99 00	-	1,200 00	1,052 00	
Bristol Central, .	121 00	66 00	74 00	10 00	122 00	15 00	58 00	1,225 00	30 00	74 00	96 00	-	2,346 00	1,891 00	1,891 08
Plymouth, . .	92 00	131 00	46 00	30 00	67 00	21 00	95 00	740 00	37 00	50 00	70 00	65 00	1,702 00	1,444 61	1,444 61
Marshfield, . .	4 00	26 00	17 00	9 00	15 00	5 00	28 00	51 00	-	23 00	25 75	-	327 00	203 75	185 75
Hingham, . .	48 00	59 00	53 73	21 00	38 50	-	47 00	83 00	44 00	64 00	25 00	42 00	742 00	525 25	525 25
Barnstable, . .	-	6 00	26 00	6 00	24 00	7 00	29 00	52 00	23 00	38 00	16 00	‡70 00	330 00	322 00	322 00
Nantucket, . .	38 00	69 00	38 00	4 50	15 00	10 00	15 00	67 00	24 00	9 00	22 00	-	494 50	301 00	301 00
Martha's Vineyard,	20 00	44 50	46 75	8 75	24 00	29 25	44 00	41 00	37 00	10 00	11 50	15 00	354 50	331 75	331 75
Totals, . .	$1,318 00	$1,430 50	$972 73	$465 50	$1,428 50	$689 00	1,053 00	$9,801 00	$1,384 25	$902 00	$1,003	$1,208 75	$25,631 75	$21,773 81	$19,878 92

* None of which was for racing.

† Herds of cattle.

‡ Trotting.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED—Continued.

FARM PRODUCTS.

SOCIETIES.	Indian Corn.	Wheat.	Rye.	Barley.	Oats.	Beans.	Grass Crops.	Grass Seeds.	Potatoes.	Carrots.	Beets.	Parsnips.	English Turnips.	Ruta Bagas.	Onions.	Other Root Crops.
Massachusetts,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Essex,	$10 00	-	-	-	-	-	-	-	-	$8 00	-	-	-	$8 00	$8 00	-
Middlesex,	8 00	$3 00	$2 00	-	$2 00	-	-	-	-	-	-	-	-	-	-	*$130 00
Middlesex North,	5 00	-	5 00	-	-	-	-	-	-	-	-	-	-	-	-	-
Middlesex South,	34 00	-	-	-	5 00	-	-	-	-	-	-	-	-	-	-	54 75
Worcester,	5 00	1 00	2 00	$1 00	1 00	$1 00	-	-	$6 00	1 00	$1 00	$1 00	-	-	1 00	*6 50
Worcester West,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Worcester North,	46 50	50 00	6 00	-	6 00	6 00	-	-	3 50	3 00	-	-	-	2 00	1 25	16 75
Worcester North-West,	4 00	2 00	-	-	2 00	1 00	-	-	3 00	-	1 00	-	$1 00	-	1 00	-
Worcester South,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Worcester South-East,	3 00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hamps., Franklin & Hampden,	2 50	6 00	1 00	-	1 00	-	-	-	11 00	-	4 00	-	-	-	-	-
Hampshire,	4 00	10 50	1 50	-	50	-	-	-	50	50	-	50	-	-	8 50	6 75
Highland,	9 00	5 00	3 00	3 00	5 00	5 00	$3 00	$5 00	9 00	6 50	4 00	-	-	-	-	-
Hampden,	1 00	-	-	-	-	-	-	-	13 75	10 00	-	-	-	10 50	50	-

Hampden East,	$0 75	–	–	–	$0 50	$1 25	–	–	$1 75	–	$0 75	–	$1 75	$1 50	–	$13 50
Union,	11 00	–	$2 00	$3 00	3 00	–	$3 00	–	3 00	$2 00	–	–	2 00	–	–	6 00
Franklin,	12 25	$11 25	–	–	1 00	75	–	–	50	–	–	–	–	–	$0 25	12 25
Housatonic,	108 00	49 00	60 00	20 00	55 00	3 00	18 00	$9 00	27 00	14 00	18 00	–	–	9 00	–	‡14 00
Berkshire,	56 00	31 00	56 00	35 00	56 00	5 00	12 00	9 00	56 00	9 00	8 00	–	9 00	12 00	–	70 50
Hoosac Valley,	21 00	18 00	14 00	15 00	15 00	5 00	9 00	†21 25	21 00	3 00	6 00	–	6 00	–	5 00	–
Norfolk,	–	–	–	4 00	–	–	4 00	–	–	–	–	–	–	–	–	69 00
Bristol,	30 00	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bristol Central,	45 00	2 00	6 00	8 00	8 00	2 00	–	–	28 00	1 00	1 00	$1 00	–	6 00	11 00	‡15 00
Plymouth,	35 00	–	10 00	6 00	–	–	–	–	12 00	–	–	–	12 00	–	–	–
Marshfield,	20 00	–	50 00	–	2 50	1 50	–	–	22 00	–	–	–	–	–	3 00	18 85
Hingham,	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*32 60
Barnstable,	8 00	–	–	–	–	–	–	–	6 00	–	–	–	–	–	–	30 50
Nantucket,	–	–	–	–	10 00	–	–	–	–	–	–	–	–	–	–	–
Martha's Vineyard,	33 90	–	5 80	–	18 00	5 39	20 00	–	14 78	–	1 25	–	5 54	–	4 80	–
Totals,	$512 90	$218 75	$224 30	$95 00	$191 50	$36 89	$69 00	$44 25	$237 78	$58 00	$45 00	$2 50	$37 29	$49 00	$44 30	$496 95

* Vegetables. † And other seeds. ‡ Cabbage.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED—Continued.

FARM PRODUCTS—Concluded.

SOCIETIES.	Total amount offered for Grain and Root Crops.	Total am't awarded for Grain and Root Crops.	Total am't paid for Grain and Root Crops.	Am't awarded for Broomcorn Brush.	For Fruits.	For Flowers.	Any other cultivated Crops.	Milk.	Butter.	Cheese.	Honey.	Wheat Bread.	Rye and Indian Bread.	Corn Bread.	Total am't paid out under the head of Farm Products.
Massachusetts,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Essex,	$138 00	$34 00	$34 00	-	$158 00	$24 00	*$48 00	-	$28 00	$13 00	-	-	-	†$18 00	$515 00
Middlesex,	174 00	145 00	145 00	-	268 25	47 00	-	-	15 00	-	‡$25 00	$12 00	$11 00	-	523 25
Middlesex North,	56 00	50 50	38 00	-	124 00	-	-	-	15 00	-	-	12 00	6 00	-	138 00
Middlesex South,	131 00	93 75	93 75	-	62 65	14 00	-	-	14 00	-	§27 50	†14 00	-	-	225 70
Worcester,	43 50	33 50	18 75	-	-	12 50	-	-	23 00	48 00	-	7 45	2 00	-	216 50
Worcester West,	42 00	-	-	-	61 00	25 25	11 25	-	10 00	51 00	-	5 00	6 00	-	160 50
Worcester North,	276 75	111 00	98 00	-	62 25	22 00	-	-	15 50	1 50	-	3 50	-	-	191 50
Worcester North-West,	26 00	18 00	17 67	-	36 00	12 00	9 00	-	9 00	8 00	-	3 00	3 00	-	85 33
Worcester South,	50 00	-	-	-	24 00	6 00	15 25	-	9 00	14 00	25	11 00	6 00	-	86 00
Worcester South-East,	96 00	3 00	2 40	-	68 50	13 75	*28 00	-	18 00	2 00	50	2 00	-	-	110 20
Hamps., Franklin & Hampden,	97 00	25 50	6 50	-	44 25	12 00	-	-	10 00	-	1 00	4 50	2 50	-	71 50
Hampshire,	101 10	33 25	32 00	-	55 00	10 80	3 00	-	8 00	3 00	-	4 00	11 00	-	126 50
Highland,	94 00	57 50	57 50	-	10 75	2 00	13 00	-	6 50	6 50	50	75	75	50	99 25

Hampden,	$497 50	$35 75	$32 50	-	$37 50	$3 00	$36 75	-	$15 00	$8 00	$1 50	$6 00	-	-	$83 50
Hampden East,	156 00	21 75	21 75	-	35 00	9 25	-	-	16 75	13 00	3 00	4 00	$2 50	-	96 34
Union,	51 00	35 00	35 00	-	26 75	2 50	-	-	5 00	5 00	-	1 00	1 00	$1 00	77 25
Franklin,	54 00	38 25	36 75	-	73 00	21 00	-	-	18 00	22 00	3 50	5 25	7 00	5 00	185 00
Housatonic,	498 00	404 00	404 00	-	141 00	35 00	-	-	36 00	36 00	12 00	9 00	6 00	6 00	685 00
Berkshire,	-	424 50	424 50	-	90 00	17 50	190 00	-	41 00	54 00	10 00	20 00	10 00	10 00	867 00
Hoosac Valley,	190 00	159 00	159 00	-	60 00	14 25	71 00	-	15 00	44 00	15 00	8 00	6 00	-	392 50
Norfolk,	153 00	77 00	80 00	-	194 00	37 00	-	-	23 00	-	-	12 00	5 00	-	250 00
Bristol,	443 00	130 00	-	-	137 00	35 00	-	-	28 00	16 00	10 00	7 00	5 00	-	-
Bristol Central,	246 00	134 00	134 00	-	114 00	27 50	-	-	28 00	23 00	18 00	7 00	5 00	-	222 50
Plymouth,	203 00	75 00	75 00	-	97 25	44 00	-	-	39 00	39 00	-	15 00	15 00	-	677 25
Marshfield,	150 00	71 35	68 00	-	55 40	15 00	-	-	15 00	15 00	§20 00	5 00	3 00	-	196 40
Hingham,	160 00	32 60	32 60	-	110 90	25 95	32 60	-	11 00	-	11 55	†11 75	-	-	236 35
Barnstable,	116 00	44 50	44 50	-	51 00	19 00	-	-	6 00	5 00	10 00	8 00	6 00	7 00	156 50
Nantucket,	135 00	10 00	10 00	-	46 00	14 75	-	-	15 00	-	-	4 50	-	-	90 00
Martha's Vineyard,	166 00	109 46	109 46	-	56 50	7 50	-	-	12 25	4 00	-	4 75	2 50	2 00	198 96
Totals,	$4,526 85	$2,440 16	$2,210 63	-	$2,299 95	$528 50	$447 85	-	$502 00	$434 00	$199 30	$207 95	$122 25	$49 50	$6,976 78

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* Vegetables at Fair.

† Different kinds of bread.

‡ Canned fruits and vegetables.

§ Jellies, preserves, &c.

ANALYSIS OF PREMIUMS AND GRATUITIES AWARDED—Concluded.

MISCELLANEOUS.

SOCIETIES.	For Agricultural Implements.	Offered for raising forest trees.	Awarded for the same.	For experiments on manures.	Amount awarded for objects strictly agricultural not specified before.	For objects not strictly agricultural; domestic manufactures, &c.	No. of persons who received premiums and gratuities.
Massachusetts, . .	–	$1,000 00	$1,000 00	–	–	*$770 00	4
Essex, ...	$31 00	30 00	–	$25 00	$8 00	93 00	282
Middlesex, . . .	78 00	–	–	–	†23 00	163 50	262
Middlesex North, .	23 00	–	–	–	–	–	204
Middlesex South, .	36 00	60 00	–	15 00	–	86 00	194
Worcester, . . .	–	22 00	–	–	–	36 00	129
Worcester West, . .	5 50	30 00	–	10 00	–	87 82	236
Worcester North, .	34 00	50 00	–	–	8 50	215 50	161
Worcester North-West,	–	–	–	–	5 00	123 75	127
Worcester South, .	–	35 00	–	–	–	50 00	139
Worcester South-East,	10 00	30 00	–	–	–	132 50	199
Hampshire, Franklin and Hampden,	28 00	20 00	–	–	–	33 50	181
Hampshire, . . .	26 50	12 00	–	40 00	99 00	111 20	219
Highland, . . .	7 00	–	–	–	–	107 90	157
Hampden, . . .	49 00	15 00	–	–	5 00	78 28	76
Hampden East, . .	8 00	25 00	–	26 00	10 75	76 25	123
Union, ...	3 00	–	–	–	–	51 59	113
Franklin, . . .	11 50	10 00	–	9 00	–	105 25	212
Housatonic, . . .	55 00	–	–	–	–	‡481 00	323
Berkshire, . . .	88 00	–	–	–	–	352 00	576
Hoosac Valley, . .	17 00	–	–	14 00	–	117 25	260
Norfolk, . . .	18 00	15 00	–	6 00	–	96 50	210
Bristol, ...	50 00	30 00	26 00	–	–	325 00	550
Bristol Central, . .	19 00	–	–	–	–	301 50	276
Plymouth, . . .	15 00	60 00	–	–	26 00	173 50	440
Marshfield, . . .	–	50 00	–	–	–	110 00	473
Hingham, . . .	20 00	–	–	–	–	336 59	500
Barnstable, . . .	–	7 00	–	–	–	83 05	268
Nantucket, . . .	–	21 00	–	–	33 75	56 50	–
Martha's Vineyard, .	4 00	25 00	–	16 00	17 22	123 35	251
Totals, . . .	$636 50	$1,517 00	$1,026 00	$161 00	$236 22	$4,881 78	$71 45

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* $500 for fish culture; $270 for four scholarships at the State Agricultural College.

† On reports and statements.

‡ $205 trotting horses premium not paid.

NAMES of Cities and Towns to which the Premiums and Gratuities were disbursed, and the amount to each.

ESSEX.

Beverly,	$22 00	Middleton,	$2 00
Boston,	15 00	Newbury,	99 00
Bradford,	25 00	Newburyport,	57 00
Danvers,	134 00	North Andover,	55 00
Essex,	39 00	Peabody,	25 00
Georgetown,	29 00	Rockport,	5 00
Gloucester,	11 00	Rowley,	25 00
Groveland,	31 00	Salem,	59 00
Hamilton,	132 00	Topsfield,	19 00
Haverhill,	35 00	Wenham,	29 00
Ipswich,	190 00	West Newbury,	10 00
Lynnfield,	5 00		
Marblehead,	15 00	Total,	$1,077 00
Methuen,	9 00		

MIDDLESEX.

Acton,	$113 75	Groton,	$3 00
Arlington,	71 25	Hudson,	21 00
Assabet,	7 75	Lexington,	197 25
Bedford,	6 25	Lincoln,	88 25
Belmont,	117 00	Leominster,	2 00
Billerica,	5 00	Littleton,	20 75
Boston,	40 00	Marlborough,	5 00
Boxborough,	4 00	Medford,	50
Burlington,	51 00	Pepperell,	3 00
Cambridge,	71 00	Providence, R. I.,	13 00
Carlisle,	5 00	Reading,	10 00
Chelmsford,	6 50	Shirley,	3 00
Concord,	349 00	Somerville,	6 00
Dracut,	16 00	Stoneham,	13 25
Fitchburg,	13 00	Stow,	3 50
Framingham,	33 00	Sudbury,	30 00

MIDDLESEX — Concluded.

Waltham,	$93 75	Woburn,	$69 00
Wayland,	16 75	Worcester,	3 00
Weston,	17 50		
Winchester,	32 75	Total,	$1,561 75

MIDDLESEX NORTH.

Acton,	$28 00	Tewksbury,	$106 25
Billerica,	10 00	Tyngsborough,	35 00
Chelmsford,	88 75	Wilmington,	50
Dracut,	122 50	Winchester,	7 00
Dunstable,	6 00		
Groton,	6 00	Total,	$761 25
Lowell,	351 25		

MIDDLESEX SOUTH.

Ashland,	$4 40	Sherborn,	$3 00
Framingham,	732 77	Southborough,	32 00
Holliston,	11 75	Sudbury,	41 00
Hopkinton,	12 00	Wayland,	82 25
Marlborough,	12 50		
Natick,	34 00	Total,	$1,077 17
Out of the district,	111 50		

WORCESTER.

Auburn,	$4 00	Mendon,	$10 00
Barre,	108 00	Millbury,	123 00
Bolton,	5 00	Nashua, N. H.,	100 00
Boylston,	31 00	North Braintree,	14 00
Charlton,	11 00	Oxford,	25 00
Dudley,	16 50	Princeton,	76 00
East Brookfield,	5 00	Rutland,	9 00
Grafton,	12 00	Shrewsbury,	6 00
Holden,	6 00	South Framingham,	20 00
Leicester,	6 00	Sterling,	3 00

WORCESTER—CONCLUDED.

Sturbridge,	$18 00	Wilkinsonville,	$15 00
Sutton,	117 00	Worcester,	961 75
Northborough,	6 00		
Warren,	27 00	Total,	$1,759 25
Webster,	24 00		

WORCESTER WEST.

Athol,	$5 25	Petersham,	$15 25
Barre,	586 85	Phillipston,	26 00
Brookfield,	32 00	Princeton,	92 00
Charlton,	14 00	Sturbridge,	17 00
Fitchburg,	32 00	Sutton,	52 00
Framingham,	75 00	Unknown,	40 00
Hardwick,	95 00	Warren,	60 50
Hubbardston,	9 25	West Brookfield,	6 00
New Braintree,	36 85	Worcester,	87 00
North Brookfield,	24 00		
Oakham,	25 62	Total,	$1,411 57
Palmer,	80 00		

WORCESTER NORTH.

Ashburnham,	$2 00	Oakdale,	$6 00
Ashby,	12 50	Princeton,	204 00
Boston,	105 50	Shirley,	35 00
Fitchburg,	925 75	Sterling,	18 00
Greenfield,	18 00	Westminster,	28 50
Lancaster,	5 00	Wilton, N. H.,	25 00
Leominster,	124 50		
Lunenburg,	97 50	Total,	$1,607 25

WORCESTER NORTH-WEST.

Athol,	$291 00	Brattleborough, Vt.,	$6 00
Barre,	30 50	Fitchburg,	150 00
Boston,	25 00	Hartford, Conn.,	200 00

WORCESTER NORTH-WEST—Concluded.

Manchester, N. H.,	$8 00
Montague,	9 00
New Salem,	30 00
Orange,	22 25
Petersham,	20 00
Phillipston,	78 00
Royalston,	$34 00
Templeton,	31 17
Winchendon,	8 67
Worcester,	67
Total,	$944 26

WORCESTER SOUTH.

Boston,	$10 00
Brimfield,	25 50
Brookfield,	65 00
Charlton,	128 50
Dudley,	23 25
Grafton,	20 00
Holland,	41 50
Leicester,	9 00
Melrose,	1 25
Palmer,	50
Rochdale,	7 00
Spencer,	$5 00
Southbridge,	111 25
Sturbridge,	123 00
Sutton,	50 00
Warren,	71 50
Wales,	1 00
Ware,	2 00
Webster,	45 00
Wilkinsonville,	8 00
Total,	$748 25

WORCESTER SOUTH-EAST.

Ashland,	$17 55
Bellingham,	9 95
Blackstone,	12 75
Framingham,	28 75
Grafton,	21 15
Hopkinton,	31 95
Holliston,	13 15
Medway,	9 65
Mendon,	148 20
Milford,	$241 40
Northbridge,	1 60
Sutton,	15 95
Upton,	39 55
Uxbridge,	21 15
Westborough,	26 35
Woonsocket,	7 10
Total,	$646 20

HAMPSHIRE, FRANKLIN AND HAMPDEN.

Amherst,	$46 00
Buckland,	8 50
Chicopee,	$6 00
Conway,	19 50

HAMPSHIRE, FRANKLIN AND HAMPDEN—Concluded.

Cummington,	$37 00
Deerfield,	203 00
Easthampton,	34 50
Goshen,	4 00
Granby,	20 00
Hadley,	66 00
Hatfield,	71 50
Holyoke,	8 50
Huntington,	6 00
Middlefield,	8 00
Northampton,	224 50
Rowe,	$1 50
Shelburn,	128 00
South Hadley,	18 64
Southampton,	54 95
Sunderland,	23 00
Westfield,	62 00
Whateley,	7 00
Williamsburg,	32 00
Total,	$990 09

HAMPSHIRE.

Amherst,	$227 65
Belchertown,	11 30
Conway,	7 25
Hadley,	136 00
Hatfield,	18 25
Holyoke,	2 12
Leverett,	16 25
Northampton,	4 00
Pelham,	4 75
Prescott,	$9 00
South Deerfield,	6 00
South Hadley,	20 00
Southampton,	4 00
Sunderland,	122 25
Various other towns,	23 13
Total,	$611 95

HIGHLAND.

Becket,	$64 25
Blandford,	8 25
Chester,	44 50
Dalton,	22 00
Easthampton,	75
Hatfield,	1 00
Hinsdale,	102 90
Huntington,	2 50
Lanesborough,	9 00
Lee,	8 00
Middlefield,	223 75
Montgomery,	3 00
Northampton,	$6 00
Otis,	25
Peru,	58 50
Pittsfield,	20 00
Plainfield,	50
Sandisfield,	2 00
Washington,	8 00
West Chesterfield,	4 00
Worthington,	8 00
Total,	$600 15

HAMPDEN.

Aquawam,	$25 00	Middlefield,	$2 50
Blandford,	3 00	Springfield,	162 75
Buckland,	2 50	West Springfield,	115 25
Chicopee,	96 75	Westfield,	66 00
Deerfield,	10 00	Wilbraham,	32 00
Longmeadow,	98 00		
Ludlow,	15 00	Total,	$628 75

HAMPDEN EAST.

Belchertown,	$33 50	Palmer,	$175 00
Brimfield,	30 50	Sturbridge,	5 00
Holland,	16 00	Warren,	26 25
Longmeadow,	4 50	Wilbraham,	65 13
Ludlow,	10 50		
Monson,	240 35	Total,	$606 73

UNION.

Agawam,	$1 50	Pittsfield,	$1 60
Becket,	2 50	Russell,	10 50
Blandford,	305 60	Sandisfield,	1 00
Chester,	2 87	Suffield, Conn.,	15 00
Granville,	34 00	Tolland,	1 00
Hadley,	16 67	Westfield,	22 17
Middlefield,	3 00		
Montgomery,	4 18	Total,	$427 84
Otis,	6 25		

FRANKLIN.

Athol,	$1 00	Erving,	$4 50
Bernardston,	26 50	Gill,	19 75
Buckland,	8 00	Greenfield,	161 25
Coleraine,	20 00	Guilford, Vt.,	3 00
Conway,	77 00	Hatfield,	2 00
Deerfield,	195 50	Leverett,	3 50

FRANKLIN—CONCLUDED.

Leyden,	$2 00	Shelburne,	$262 75
Montague,	32 25	Sunderland,	73 00
Northfield,	8 25		
Rowe,	1 50	Total,	$901 75

HOUSATONIC.

Alford,	$96 00	Pittsfield,	$5 00
Becket,	10 00	Richmond,	24 00
Egremont,	187 00	Sandisfield,	5 00
Great Barrington,	471 00	Sheffield,	398 00
Lee,	137 00	Stockbridge,	148 00
Lenox,	115 00	West Stockbridge,	40 00
Monterey,	32 00		
Mount Washington,	17 00	Total,	$1,743 00
New Marlborough,	68 00		

BERKSHIRE.

Adams,	$379 00	Peru,	$12 00
Alford,	8 00	Pittsfield,	760 00
Becket,	8 00	Richmond,	119 50
Cheshire,	118 00	Savoy,	2 50
Dalton,	78 50	Sheffield,	45 00
Egremont,	27 00	Stockbridge,	150 50
Great Barrington,	156 00	Tyringham,	1 00
Hancock,	38 00	Washington,	3 00
Hinsdale,	50 50	West Stockbridge,	18 00
Lanesborough,	242 50	Williamstown,	96 00
Lee,	153 50	Windsor,	7 00
Lenox,	290 50		
Monterey,	50	Total,	$2,767 50
New Ashford,	28 50		

HOOSAC VALLEY.

Cheshire,	$90 50	Dalton,	$8 00
Clarksburg,	5 75	Florida,	31 75

HOOSAC VALLEY—Concluded.

Great Barrington,	$15 00	Pittsfield,	$9 00
Huntington,	5 00	Pownal, Vt.,	42 00
Lanesborough,	7 25	Rowe,	3 00
Lee,	6 00	South Adams,	147 75
Lenox,	9 00	Stamford, Vt.,	7 00
Manchester, N. H.,	6 00	Williamstown,	257 75
New York City,	1 50		
North Adams,	365 50	Total,	$1,017 75

NORFOLK.

Boston,	$113 00	Needham,	$146 00
Brookline,	42 00	Quincy,	25 00
Canton,	56 00	Randolph,	8 50
Dedham,	131 75	Roxbury,	139 00
Dorchester,	287 00	Sharon,	18 75
Dover,	58 25	Stoughton,	194 75
Franklin,	12 00	Walpole,	24 50
Halifax,	20 00	West Roxbury,	95 00
Hyde Park,	87 25	Wrentham,	22 00
Medfield,	2 00		
Milton,	101 75	Total,	$1,584 50

BRISTOL CENTRAL.

Acushnet,	$92 75	Myrickville,	$33 50
Berkley,	180 75	Norton,	28 00
Boston,	4 00	New Bedford,	611 00
Bridgewater,	222 00	Providence, R. I.,	89 00
Campello,	5 00	Raynham,	136 00
Dartmouth,	156 50	Rehoboth,	8 00
Dighton,	24 50	Rochester,	24 25
Fairhaven,	59 00	Seekonk,	50 00
Fall River,	353 75	Somerset,	34 25
Freetown,	43 00	Taunton,	193 75
Lakeville,	204 50	Westport,	56 00
Long Plain,	5 00		
Middleborough,	50 00	Total,	$2,664 50

PLYMOUTH.

Abington,	$82 75	Marshfield,	$33 00
Bridgewater,	712 00	Mattapoisett,	6 75
Boston,	6 00	Middleborough,	144 75
Carver,	19 50	North Bridgewater,	368 25
Duxbury,	20 00	Pembroke,	9 25
East Bridgewater,	210 75	Plymouth,	100 25
Halifax,	135 50	Plympton,	49 75
Hanson,	3 75	Rochester,	8 75
Hingham,	23 75	Wareham,	40 00
Kingston,	26 00	West Bridgewater,	248 75
Lakeville,	55 00		
Marion,	8 00	Total,	$2,310 10

MARSHFIELD.

Abington,	$5 00	Marshfield,	$374 88
Boston,	10 75	Middleborough,	50
Carver,	50	Pembroke,	31 05
Chelsea,	3 00	Plymouth,	23 50
Dedham,	2 00	Scituate,	36 35
Duxbury,	113 85	South Scituate,	9 75
Halifax,	3 50	Stoughton,	75
Hanson,	6 50		
Hanover,	16 00	Total,	$645 13
Kingston,	7 25		

HINGHAM.

Boston,	$34 10	North Bridgewater,	$8 00
Cohasset,	16 50	Quincy,	50 15
Hanover,	4 25	Scituate,	48 90
Hingham,	868 57	Weymouth,	64 40
Hull,	25 00		
Marshfield,	8 25	Total,	$1,128 02

BARNSTABLE.

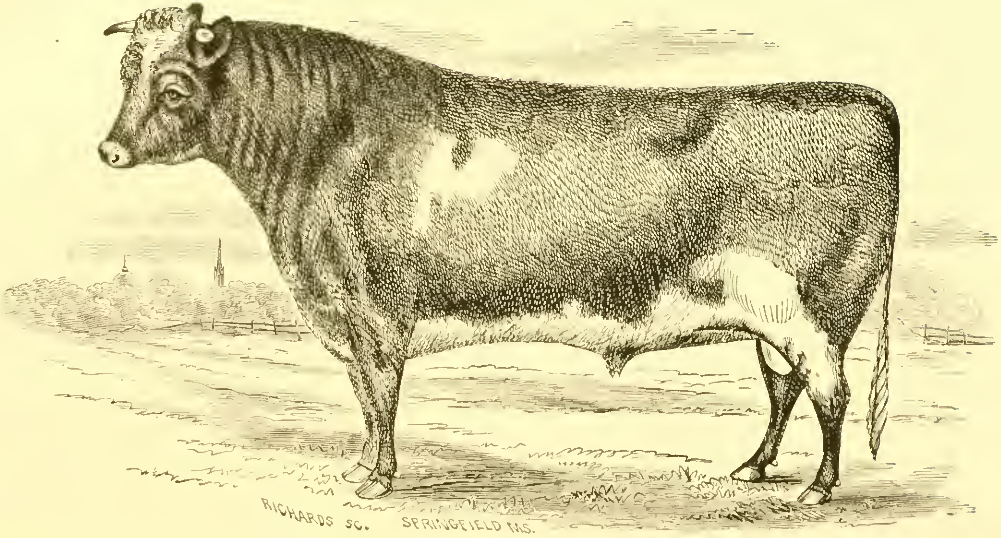
Barnstable,	$290 55	West Barnstable,	$101 00
Chatham,	14 00	Yarmouth,	53 00
Dennis,	53 00		
Hyannis,	55 00	Total,	$587 55
Sandwich,	41 00		

NANTUCKET.

Nantucket,	$509 50

MARTHA'S VINEYARD.

Chilmark,	$321 80	Tisbury,	$287 14
Edgartown,	78 12		
Gay Head,	3 00	Total,	$690 06


RICHARDS SC.
SPRINGFIELD MS.

ROB ROY.—Owned by WILLIAM BIRNIE (Springfield).
See Preface to the Abstract.

ABSTRACT OF RETURNS

OF THE

AGRICULTURAL SOCIETIES

OF

MASSACHUSETTS,

1870.

EDITED BY
CHARLES L. FLINT,
SECRETARY OF THE STATE BOARD OF AGRICULTURE.

BOSTON:
WRIGHT & POTTER, STATE PRINTERS, No. 79 MILK STREET.
1871.

PREFACE.

I am indebted to William Birnie, Esq., of Springfield, for the use of the cuts of stock, which were drawn and engraved at his expense for this Report.

The cow "Betsie," No. 274 Ayrshire Herd Book, is a dark red and white, calved August 6, 1862. She was bred and is owned by Mr. Birnie. Her sire, "Blossom," No. 10, and her dam, "Betty, 5th," No. 24.

"Rob Roy" was also bred by Mr. Birnie. His pedigree will appear in the forthcoming third volume of the Ayrshire Herd Book.

The illustrations of the able paper on Insects, by Dr. Packard, are also new, and were drawn and engraved expressly for the Report. Dr. Packard hopes that farmers and gardeners will take an interest in informing him of the habits and injuries done by noxious insects, and send specimens enclosed in pasteboard, or wooden or tin boxes, or vials carefully packed, by mail or otherwise, of the insects and portions of trees or plants injured. In this way materials for future reports can be collected. He will always be ready to answer any inquiries regarding injurious and other insects, name specimens or collections, and, if convenient, visit gardens or farms peculiarly infested. Caterpillars, grubs, maggots, etc., should, if possible, be packed in tight tin boxes (air holes are not necessary), accompanied with leaves of their food-plants or other food.

I must repeat the suggestion that I have already so often made, that the Statements which appear in the Transactions of the several agricultural societies are, as a general rule, too indefinite. This applies to the statements of experiments and the cultivation of crops rather than to the reports of committees. Owing to the unusual length of the Secretary's Report, it has been necessary to condense the returns of societies to a greater extent than has sometimes been the case. It is proper, however, to say that, taken as a whole, the work of most of the societies, so far as appears in their returns, shows a marked improvement upon previous years. It is to be hoped that the desire for progress, now so widely diffused, will lead to new efforts to raise the standard higher every year, and thus comply with the spirit as well as with the letter of the law, by returning a just equivalent for the bounty so generously bestowed.

CHARLES L. FLINT.

BOSTON, January 25, 1871.

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1871.

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Secretary—DAVID MAYHEW, of North Tisbury.

AGRICULTURAL EXHIBITIONS.

1871.

Essex, at *Ipswich*,	September 26 and 27.
Middlesex, at *Concord*,	September 27 and 28.
Middlesex North, at *Lowell*,	September 5, 6, 7, 8 and 9.
Middlesex South, at *Framingham*,	September 20 and 21.
Worcester, at *Worcester*,	September 21 and 22.
Worcester West, at *Barre*,	September 28 and 29.
Worcester North, at *Fitchburg*,	September 26 and 27.
Worcester North-West, at *Athol*,	October 4 and 5.
Worcester South, at *Sturbridge*,	September 14 and 15.
Worcester South-East, at *Milford*,	September 26 and 27.
Hampshire, Franklin and Hampden, at *Northampton*,	October 5 and 6.
Hampshire, at *Amherst*,	September 26 and 27.
Highland, at *Middlefield*,	September 14 and 15.
Hampden, at *Springfield*,	October 3 and 4.
Hampden East, at *Palmer*,	October 10 and 11.
Union, at *Blandford*,	September 21 and 22.
Franklin, at *Greenfield*,	September 28 and 29.
Berkshire, at *Pittsfield*,	October 3, 4 and 5.
Housatonic, at *Great Barrington*,	September 27, 28 and 29.
Hoosac Valley, at *North Adams*,	September 19, 20 and 21.
Norfolk, at *Readville*,	September 21 and 22.
Marshfield, at *Marshfield*,	October 5 and 6.
Bristol, at *Taunton*,	September 26, 27 and 28.
Bristol Central, at *Myrick's*,	September 20, 21 and 22.
Plymouth, at *Bridgewater*,	September 28, 29 and 30.
Hingham, at *Hingham*,	September 26 and 27.
Barnstable, at *Barnstable*,	October 3 and 4.
Nantucket, at *Nantucket*,	September 27 and 28.
Martha's Vineyard, at *West Tisbury*,	October 17 and 18.

AGRICULTURE OF MASSACHUSETTS.

AMERICAN MANIA FOR LARGE FARMS.

From an Address before the Essex Agricultural Society.

BY BENJAMIN F. BUTLER.

Our fathers came from a land-loving, land-hoarding race, whether the blood which flows in our veins is drawn from the tenant-farmer of England or the lord of the soil. From the first, our ancestors knew, by bitter experience, the want of land, the grinding oppression of rent-paying—had felt the power which possession of it gives—the place which the lord of the soil held amongst princes and kings ; aye, and had felt what was the fate of the landless, and how little he could withstand the oppression of the landlord. If, as may be, we reckon back our blood from some noble house of England, it came through the veins of the cadet, the younger son of that house, whom the law of primogeniture had made as landless as the tenant. He had seen all of it swept away by the elder brother, while he was left to seek his fortune and his livelihood in the wilds of a new world. Or, if our ancestry was of the down-trodden sons of Ireland, they had learned, through tyranny, wrong and starvation, that without land man was nothing ; that to be landless was to be helpless.

Thus we came naturally, and by inheritance, to be imbued almost with a mania for soil-getting ; and our fathers strove to possess themselves of as much land as possible to encompass with their fences, and to assure its title in themselves by the most carefully guarded records. Whoever looks over the farms of New England, even, will see that quantity of land in the hands of the individual was all that was sought for, while in the far West, where land was practically illimitable, and to be had almost without price, we hear of farmers counting their acres by thousands upon thousands. And in New York, in the earlier days, the manors of the patroons equalled in extent and exceeded in richness of soil many a German principality. Singularly enough, the laws of primogeniture and entail, in their principles and effects, although not in force, took strong hold upon our people, so that the father, in fact, gave the bulk of his land substantially to one of his sons. Both these laws made strong battle to maintain themselves as a part of our systems of government in the conventions which formed the earlier constitutions in most of the States, and not by strong votes in numbers were they cast out. But while the law, through its enactments, divided the estates among the children equally, yet in practice, almost as a rule, the farm went to one. Who ever in New England thought, or who ever now thinks, of dividing his land among his daughters? How rarely is the land divided by will among the sons? The practice which has obtained is, as we all know, for some one of the sons to remain with the father with the expectation of being given the farm, either by paying small legacies to his sisters and larger ones to his brothers, or when the estate is inconsiderable in value, or, as a very common practice, by being the assured recipient of the farm, by giving a bond for the maintenance of his parents during their lives.

Thus has it come to pass that the agricultural land of New England—and it is equally true of Massachusetts—has remained substantially undivided. The boundaries of many farms are the same that they were in the time of the Revolution, save where house lots may have been sold from them, if bordering on a village. Some have been increased in their boundaries; and is it not to-day a boast among some of the farmers who sit before me, that the boundaries of their farms are the same as those of their fathers, their grandfathers, back even to the third and fourth generations?

In the settlement of the country there were reasons for this aggregation of land which do not now obtain. New England men depended upon the forest for their fuel and for their timber; so that large portions of land might well have been held to supply the fence, the fire and the building material. Still, it will be seen that in most of the farms, even, that reason did not obtain, for a most eager desire was manifested for clearing the land—avarice, apparently, prompting the owner to burn the wood and skim the cream from the virgin soil. It is evident that a wish to preserve woodland for fuel, in the absence of coal and peat which now supply so largely the fuel of Massachusetts, did not deter our fathers from cutting away the forest. Indeed, the early New England farmer seemed to have two controlling ideas in the selection and management of his farm: first, to set his house on the top of a hill, so as to render access to it as difficult as possible; and, second, to cut off all the wood upon his land, so as to render it as dismal and bare as possible. These results obtained, he became comfortable and thoroughly respectable. Statistics show that to-day there are more acres of growing woodland in the Commonwealth, although not as valuable, than there were in the days of the Revolution.

This aggregation of large quantities of land in one hand has resulted in so poor tillage and so little productiveness, because of the inability to till so much in a proper manner, and has made farming so unprofitable, that—taking the waste and barren pastures, the unimproved woodland where the shrub-oak and the stunted pine have filled the place of the maple, the beech, the birch, the ash, and the oak—if all the agricultural land of Massachusetts were put at sale to-day at a price which is asked for it, the proceeds would not be sufficient to dig the stones and rebuild the stone-walls which fence it.

Again, we see that farming presents so few attractions as a business, that all our young men are flocking to the cities, or engaging in commerce upon the seas, or seeking adventures abroad, or homes in the Western uncultivated lands. Anything rather than here pursue the occupation of a farmer. If they farm at all, they go to the West, to make themselves new homes there. And if you ask the reason of this, you are told, "Who would spend his time upon the sterile, broken lands of Massachusetts when he can have the rich prairies of Illinois and Kansas, without a stone, or a stump, or a hill, on which to make his farm!" Probably there was never a greater fallacy than that farming can be made more profitable in the West than in New

England. What crop will you plant there of which you cannot raise more here than there to the acre? Is it corn? Compare Massachusetts, in 1867, with Ohio and Texas, to see why our sons should go either West or South to raise corn. In 1867, corn here averaged thirty-five bushels to the acre; in Ohio twenty-eight bushels to the acre; Texas twenty-eight bushels to the acre. So that, in fact, the average worth of an acre of corn in Massachusetts was from $50 to $54; in Ohio, $20 to $23, and in Texas $17 to $22. Is it wheat? The average yield of wheat in Massachusetts was sixteen bushels to the acre; in Ohio, fifteen; in Texas, nine. While the wheat of Massachusetts was worth $2.75 a bushel, or $44 to the acre, the wheat of Ohio was worth $2.40 per bushel, or $27 to $30 to the acre; and of Texas, ninety cents a bushel, or $17 to $18 to the acre. Do you wish to raise oats? Then the average yield of Massachusetts was twenty-eight bushels to the acre; of Ohio thirty; of Texas twenty-eight. The oats of Massachusetts average seventy-five cents a bushel, year in and year out, while in Texas and Ohio they are forty cents a bushel. Is it tobacco? The yield of Massachusetts is 1,100 pounds to the acre; of Ohio, 700, and Virginia, 700 pounds to the acre; and the cash value of an acre of tobacco in Massachusetts is quite treble in value that of an acre in the great tobacco State of Virginia. Is it hay? Then we averaged one ton of hay in Massachusetts to one ton and a half in Ohio, and a ton and two thirds in Texas. But for years, when harvested, the hay of Massachusetts was worth $25 a ton; the hay of Ohio from $12 to $15; and of Texas from $16 to $18. In no State in the Union are the productions of the soil, acre for acre, as tilled, taking the different kinds, so great in quantity as in Massachusetts, and no State where the product of the soil, when harvested, is so valuable. California and Minnesota exceed us in wheat, acre per acre, but fall behind us in other products. The statements I have made are so accurate that they are literally borne out by statistics to be procured at any time from the Bureau of Agriculture at Washington.

It may be answered, "All that you say is very true, but it costs so much to till an acre of ground in Massachusetts, in comparison with what you get out of it, that our brother-farmers of the West have great advantage of us." Let us meet that argument, and compare again the same States; and it will appear, taking the average of the whole amount cultivated and of the prices of the crops by the actual results, that the produce of Massachusetts of cultivated land, on an average of the whole amount, is $28 to the acre; of Ohio it is $18 to the acre; of Texas $21 to the acre; and California, which boasts of her richness in agriculture, overtopping even her mines, gives but $21 to the acre.

Both farmer and statesman will be led to inquire what is the cause of the languishment of agriculture as a business in the United States, because we have seen it more remunerative in New England than anywhere else in proportion to the amount of land under cultivation. True, we hear of the immense crops and immense farms of the West; but there it is a question of quantity and extent of farms, and not of the value of the crops. It is also true that, for a few years, when the adventurous settler takes the virgin soil, he gets crops far, far surpassing these which I have brought into comparison; but then, that is but for a few years, and he quits the land which he has cleared and reduced to cultivation, and which he declares worn out, for "fresh fields and pastures new"; and for a while (yet a moment in the nation's life), this may be repeated; but the second and the third generation certainly will find a necessity to retill the lands that their fathers have exhausted. There can be no more striking illustration of this than that which has occurred within the memory of men here.. All can remember when the Genesee Valley in New York supplied not only its own inhabitants, but all New England with the finer brands of flour. The Genesee brand of flour was the only one called for in its day, and we older men can remember the glowing accounts we read of the productiveness of the New York lands in wheat and their richness in breadstuffs. Next we hear of St. Louis flour; then we read of Minnesota flour. But the fact which most vividly portrays the rapid exhaustion of land in this country is, that wheat from California was brought in ships fifteen thousand miles, in 1868, around Cape Horn, carried by railroad and canal to the Genesee Valley, and in the Rochester mills ground to supply the wants of its inhabitants, sons of those fathers who supplied all New England, within a generation, with their surplus flour.

In searching for a remedy for this exhaustion of the soil, to find the means by which farming can become one of the profitable occupations, to bring back our boys to the homestead and the cultivation of the land,—the natural occupation of men, because men in all professions, men in trade, men in every pursuit of life, the shipmaster on the sea, and the lawyer in the forum, are all looking forward to that time in their old age when, having accumulated a fortune more or less extensive, they can come back to Mother Earth and finish life tilling the land at last,—we will see that the remedy cannot be found by any comparison we can make of the different sections of our own country. For we see the same causes producing the same effects, the same impoverishment of the soil, after a few years of skimming it, the same aggregations of land which cannot be tilled, the same unwillingness in the sons to follow the business of their fathers in tilling the earth, and everywhere even greater want of productiveness than in New England. Therefore it is that we must go to other sources of comparison to find by analogy what shall be the remedy. In this search we must turn aside from England; for there, cheap capital and tenant-farming on long leases, and non-proprietorship of the land, make a state of things which gives no room for comparison with America. Tenant-farming here is almost wholly unknown, and wherever the farmer is a tenant, it has become proverbially unprofitable.

Let us direct our attention, therefore, for the purpose of this comparison, to a land where all eyes are now turned for a wholly other and different reason. Let us examine the agriculture of France, and compare its productions with our own, and compare the habits of its people, as farmers, with ours, and see, if we can, what is it that tends to show differences in their favor. Here we may find facts which will teach the statesman and farmer both lessons in agriculture, and quite possibly facts which will arouse the attention, as surprising in themselves and containing not a little rebuke to our general self-gratulation. One of our vices as Americans is self-gratulation, a little vain-gloriousness, a little boast. We speak of our teeming West. We speak flippantly of our capability of supplying all the world with breadstuffs. True, we have the capability so to do; but it is equally lamentably true that we do not do it. The boastful Western man upon his prairies, or the Californian upon his ranche, will, not a little astonished, learn the fact that the

Empire of France, with not so much area as the State of Texas, raises more wheat, in quantity, than the United States of America, all told, reckoning from Alaska to Florida and from Texas to Maine; the area of France being only 207,480 square miles, or 132 million acres, while Texas contains 237,321 square miles, or 154 million acres. And yet the product of wheat in France, in the year 1868, was 350 million bushels; the total product of wheat in the United States for the same year was only about 240 million.

So far from our supplying the markets of the world with wheat, in the year 1867, we sent to England only four million hundred weight of wheat, or about nine million of dollars in value, while France exported to England eleven million dollars' worth of butter alone, to spread on the bread made from our wheat, or to speak less lightly, France sent more value in butter to England than we did in all kinds of breadstuffs.

Again, we go back to the year 1860, where only we can get accurate statistics of the products of the United States and the products of France: let me call your attention to the following remarkable but reliable statistics of French agriculture. France then produced 230 million bushels of oats against our 170 million; 70 million bushels of rye against our 20 million; 60 million bushels of barley against our 12 million; and 32 million bushels of buckwheat against our 12 million. Nor was she without the products of grazing and pasture land, which we suppose to be the necessity requiring our extended farms. She had 4 million horses and mules against our 4 million and a quarter; 12 million of neat cattle against our 13 million; 30 million of sheep against our 24 million, and 6 million of swine against our 16 million.

As an example of what may be the profits of the smaller industries of farming, which, by the farmers of the United States, was reckoned almost valueless, it is an astonishing fact that in the year 1866 France exported as much in value of eggs to England alone as we exported of bacon and hams, one of our chief exports of provisions, in 1868, to all the world; that is to say, in round numbers, rising of five million of dollars, while we exported eggs last year to the paltry number of 412 dozen.

No man who has not had these figures brought to his consideration, and who has not examined the agricultural productions of France, both in variety and amount, can believe that the 38 million of her inhabitants, on a territory so small as to give only three and a half acres to an inhabitant, could vie, in agricultural productions—of all that goes to make up the necessaries of living and national wealth, save cotton and tobacco—with a nation like ours, of about the same number of inhabitants, whose territory gives more than fifty acres to each inhabitant, or nearly seventeen times as much land for cultivation; and from this estimate we exclude Alaska, of which none know the extent save the walrus and polar bears. Of course a very large portion of our lands, say three-fourths, are substantially uninhabited; but these are always reckoned when we make up our national resources.

Nor is the common idea a true one, that the people of France are poor, or that our people are drawn away from farming into other and more profitable occupation, so that France does not more than equal us in the value and amount of her industries—all her industries as compared with ours; for the year 1868 her imports amounted to 679 million, and her exports to 581 million, while in the same period the imports of the United States were only 381 million and the exports were 441 million, of which exportation 72 million were gold and silver and 163 million of unmanufactured cotton, neither of which, to any extent, was exported by France, leaving only 206 million as the product of our agricultural and manufacturing industry for export, after what is consumed by our people, against 581 million, which is the surplus of her agricultural and manufacturing industry exported after maintaining her own people. And although we boast of our cotton and tobacco as sources of wealth, yet she has her wines, brandies and sugars, of which latter France exported in 1868 six million dollars, and we imported sixty millions.

The common idea in this country, that wealth is not diffused in France as with us, but is only in the hands of a few rich nobles, is another mistake quite as illusory as any of the misunderstandings of the agricultural and industrial condition of our ancient ally. While the national debt of France at the beginning of the present year was almost precisely the same as ours, being 2,700 million, yet instead of being as ours is,—1,500 million owed to foreigners, to say nothing of State and county debts, which are things unheard of in the departments of France,—it is divided among and held by more than *eleven hundred thousand Frenchmen*, giving a share of about 2,500 dollars to each. The actual diffusion of wealth among the middling and industral classes is evident, because when a loan of 90 million of dollars was offered by the Emperor to the people, an actual subscription of 3,152 million, or more than 35 times the sum asked for, was made by 781 thousand different persons (all Frenchmen, and generally in small sums), because the providence of their government, differing from ours, gives to the man who desires to invest ten dollars in the national fund the preference over him who desires to invest ten million, the small subscription being first received, and first filled.

It may be interesting, although not exactly in consonance with the purpose we have in this analysis, to compare the division of the debt of France among the people, showing the diffusion of wealth in the middling classes, with the national debt of Great Britain. Her debt amounts to 3,800 million, which is held by 126 thousand persons only, giving an average share of 30 thousand dollars to each individual as against less than one-tenth as much to each holder of the French debt.

Nor are the French people burdened with taxation more than we are. They have nothing of the taxation known with us as State taxes, but their entire taxation is a national one, and amounted with the revenues, which are another form of taxation in the aggregate, in the year 1868, to 403 million of dollars, while our taxation and revenues for the same year, paid to the national government alone, was 405 millions. But it will be observed that this taxation, while nominally about the same as ours, yet, being with us based on a much less product of trade and industry than in France—almost 50 per cent. less in fact—is really a taxation nearly 50 per cent. greater on the industry of this country than is imposed upon the industries of the French people.

But another and more certain test of the distribution of wealth in France is seen in this: the population being divided into 9 millions of families, allowing four to the family, which is nearly the ratio, one million of those families, or four million of people, are in easy circumstances, that is, able to live without work or business. Of the remaining 8 million, which may be said to be composed of the industrial and working classes, 3 million only are inhabitants of the towns. That is, of the whole population, two-fifths of the people in France live in the cities, and three-fifths live in the country. This gives a very surprising result as compared with England, where four-fifths of the whole people live in town, and one-fifth only in the country. We have yet no data with which I am acquainted to make a like comparison with this country.

All property is, then, very equally distributed among the bulk of the population. There are six million of houses in France, the greater part of them cottages with small plots of land. Nearly the whole of this number are small freeholds belonging to their occupants. In other words, more than two-thirds of the entire population own their own houses.

After hearing these statistics, the question, I have no doubt, arises to the lips of each one of my auditors, as it came to me,—how are these very great results possible? What is the secret? This may be told in a word. It is the thorough cultivation of the soil. Of her 132 million of acres, 64 million are arable; 12 million only are in meadows, or, as we say, fields and grass; 5 million in vineyards; 1½ millions in orchards and gardens; 2¼ million in miscellaneous crops; 20 million in wood and forest; a half-million in ponds; 20 million only may be called heath or waste lands, the remainder being for roads, public squares, canals and pleasure grounds—about 7 million of acres. Thus it will appear that two-thirds of the entire area of France are under actual cultivation every year.

But the question still recurs—how can this be possible? The answer is, it becomes possible because of the minute subdivision of the land, the small freeholds into which all France is divided. Before the revolution of 1792 the lands were holden largely by the nobles and by the clergy, large portions being covered with forest. These lands, of course, were cultivated by a tenantry, and as the nobleman was exempted from the most oppressive portion of the taxation, all exactions fell upon the land and upon labor. But the French revolution changed all that. All the lands of the Church and of the nobles were declared public domain, and being made the basis of the currency, were sold out in small parcels. Much of the forests were cut off, the land put into form for tillage, and, in jealousy lest the nobles should again accumulate land in large quantities through laws of entail and primogeniture, the people made it a portion of the fundamental law that all patrimonies should be equally divided among children, leaving but one-third to be disposed of by the parent if he had two children, and one-quarter only if he had three. This provision of law has withstood the several changes of government, and an attempt to modify it by Charles X. was, perhaps, the primary cause of the revolution of 1830. The effect of this salutary law has been the subdivision of landed estates and other property in France until the result has been attained which we have seen. The farms average less than fifteen acres, and there are over three million of farms containing ten acres or less. The farms in Massachusetts average 100 acres each. Do we wonder now at the difference in cultivation?

May we not deduce, therefore, fairly from this analysis and comparison of the agricultural industry of France, the proposition that the great fault of our farming is too great extent of land in each farm and too little cultivation? Is it not the duty of the statesman to inquire whether legislation should not be fitted to subdivide the land for the benefit of the whole people? and is it not equally the duty of the farmer to inquire whether less land and more cultivation would not produce greater crops?

I have given you the facts and figures and have studiously avoided giving any opinions of my own which would not be valuable. But I have endeavored to impress these very valuable and vital statistics upon you, in order to bring the questions I have last indicated to your consideration. It will be observed in this that I have not taken into account the advantages we are supposed to derive from the political liberty which we enjoy compared with France bearing the burdens of an empire, which we have seen, in fact, are no greater than the unholy and unnecessary war, through which we have passed, have imposed upon us. Nor would it have been just if I had undertaken to make any allowance in our favor for this, because, to the statesman and statistician, it is evident that for the last twenty years the agricultural portion of the people of France have enjoyed the best government possible for them. After a democracy, a pure despotism is the best government. The wrongs, sins, crimes if you please, of one man are infinitessimal in their bearing upon thirty-eight million of people. The citizens of no country have enjoyed greater protection of life, liberty and property, than has the French nation for nearly twenty years past. A man there need only so conduct himself as not to injure his neighbor and let politics alone, and for him the government was nearly perfect. I know we are accustomed to decry Napoleon, and some men do so all the more now that he is deposed and powerless. But it is not to be denied, in justice, that he has given to agricultural France the very best government she ever had, whatever may have been the action of his government upon the people of Paris, or whatever the theoretical objections to him as a usurper or personal ruler.

This is evident from two perfectly cogent series of facts: First, that since 1851 the production of grain in France has been raised from 912 million of bushels to 1,006 million in 1868; the production of wine from 739 million gallons in 1851 to 1,664 million in 1868; that the exports and imports of France have been raised from 522 million in 1851 to 1,625 million in 1868; that the inland trade has been brought up from 248 million to 1,312 million; and the value of the personal property from 1,152 million to 3,733 million, and the commercial marine from 5 million of tons to 12 million tons. And in Paris, too, the valuation of the houses is raised, under Napoleon, from 511 million to 1,191 million.

Can a government that works such results have been oppressive to the people? Have the mass of the French people been satisfied with the government? Of this there were two very conclusive proofs. It is commonly said that the votes in the several elections in favor of the Empire have been controlled by the army. But in the rural districts, where the army was not stationed, the vote in favor of the Empire has been almost unanimous, and the entire vote against it has been in the larger towns and in the city of Paris where soldiers were stationed.

But there is a still better and more conclusive answer. When people are misgoverned and dissatisfied with their government, they emigrate. Ireland has been pouring her population into this country for many years, until, from a population of less than six million, we have naturalized citizens of Irish birth, 1,611 thousand; from England, which boasts of being the freest and best governed country in Europe, with a population of 20 million, we have half a million of naturalized citizens; from Scotland, with a population of 3 million, 100 thousand; from Switzerland, the free republic of Europe, with a population of 2½ million, we have 54 thousand; from Norway, with a population of a million and a half, we have 43 thousand; from the Netherlands, with a population of 3 million, 28 thousand; from Germany—free, enlightened Germany, whose king proclaimed "her march the march of civilization"—we have a million and a half of naturalized citizens out of a population of 37 million, while from France, with a population of 38 million, we have but one hundred thousand, or about the same number that we have from Scotland with one-twelth of the population. Besides, it will be remembered that Great Britain has large colonies all over the world, making a large drain upon her surplus population.

With this exhibit of favored industry under an empire, the inquiry presses home at once, in what production have we in the republic of America any superiority over a despotism? Why should we prefer the one form of government rather than the other? The answer is an obvious one. *The republic excels in the production of men.* For while the population of France, not depleted by emigration, as we have seen, increased from 1820 to 1860 only 7 million from 31 million, the population of the United States increased from 9 million in 1820 to 31 million in 1860; and although greatly swelled by emigration, yet the increase from that source during that period was only 5 million, while the actual increase was 22 million. Or, to state facts in other words, the percentage of increase in France was, for the whole period of forty years, about 22 per cent., or one-half of one per cent. per annum, while the increase in the United States was for the same period 244 per cent., or six per cent. per annum, being twelve times greater increase in the United States than in France; and this too effected by less than one-fourth by immigration, leaving the actual increase, without immigration, nine times greater in this country than in France. Here we see the work of a republic.

DECLINE OF NEW ENGLAND AGRICULTURE.

From an Address before the Worcester North Agricultural Society.

BY ALVAH CROCKER.

Why are we cultivating less and less land every year? Why such decadence and decline in keeping up farms? Why in this district do we find such quantities of land going to waste; with the very stone walls, which formerly enclosed mowing lands and pasturage, obscured by scrub oak and alders? Why are we compelled to gaze upon so many dilapidated or deserted dwelling-houses or tumbling cellar walls, where once was the happy abode of some independent yeoman?

The same inquiry is pertinent to all New England. Vermont, for instance, whose mountains are verdant to their very crests, and whose valleys are bounded by some of the loveliest rivers and lakes on the globe,—for where can you find anything superior to the river bottoms of the Connecticut, Passumpsic and Otter rivers, or Lake Champlain,—yet Vermont, perhaps the gem of all New England States, has lost farming population the last decade. And this, though the soil, for all purposes of the farm, excels that of Great Britain and Belgium, less of course their scientific culture and manures.

With our agricultural colleges and societies all around; with rewards or premiums offered for the best farms and crops, do the people get an adequate return for the money expended for these objects?

Take, if you please, our own Worcester North District. I admit the full benefit of our social meetings, but I am talking about the farm. We owe much to such men as Lyman Nichols, Dr. J. Fisher of Fitchburg, Augustus Whitman, E. T. Miles and Solon Carter of Leominister, and men like them in enterprise, in every other town of the district, for their improvements in breeds of animals, agriculture and horticulture.

There are many such cases in the district, but are they not altogether too exceptional? Are we keeping pace, I repeat again, with other pursuits, or dwindling down, in many cases, to little patches of land, when peradventure the rest of the farm may either be indifferently tilled or even going to waste?

I do not propose to answer these queries; I have no time; and while I hope that in some respects we may be slightly improving, we still need a great many more balance sheets of cost and profits of whole farms each year, to excite a more general interest in agriculture. Let us have the figures, is the important question now, and this was well put at a former anniversary by my friend George E. Towne, Esq.

We wish to know the number of acres in the farm—acres of tillage land. What crop, cost and profit? Mowing land, including reclaimed bog and meadow. What crop and profit? Pasture lands, with description and what they feed. What profit? Cows (with breed). What profit, butter, cheese or milk? Horses (with breed). What profit? Poultry of every description. Cost and profit?

But the farmer says he cannot do all this, for he cannot afford to hire labor. Let him try. This is the word. If successful, no young lady of culture will hesitate to unite her fortunes with his. She understands how much less of risk she takes for herself and family, than in the vicissitudes of trade and manufacture. She can not only enjoy his society more than in any other pursuit whatever, but she knows full well that the old-fashioned churn exists only in history. Cheese is made in the factory, or milk sold at the door, to say nothing of beef, pork, mutton and poultry taken in similar manner, mostly at live weight, and, what is more, at such prices that if our old Puritan Fathers should ever come back to look after their progeny, they would hang them up for extortion quicker than they did the Salem witches.

Cannot afford to hire! Then why on earth does he not marry early—putting his boys to work as early, both in seed-time and harvest, and sending them to school the other six months of the year, in the good old-fashioned way? I know this is plain but not popular talk. I am told at the very threshold that it is now the fashion to send our boys to school ten months in the year. But it was not so, ladies and gentlemen, when such men as George Washington, Thomas Jefferson, Henry Clay, Daniel Webster and Abraham Lincoln were boys. It was their training upon the farm that gave to them their stalworth forms, their physical power, not only to sustain them in their mental efforts, but to grapple successfully, aye, triumphantly, with the strongest intellects of their age. I next meet another delusion, I might almost say a general hallucination, "that the West is the only spot for farming," and this idea, Utopian as it is, is doing us more harm than everything else. My farming interlocutor says I should like to stop here. I love a New England home, dislike to leave parents and others to whom I am fondly attached, the graves of dear friends, the old church and school-house, but I must go where I get better crops, forty bushels of wheat or eighty bushels of corn to the acre.

I once chanced to hear a Western farmer explaining to a candidate for emigration the astounding difference of crops in the two sections. The Western prairie, for instance, grew eighty bushels of corn to the acre, against forty here in Massachusetts, which was not fit for a farmer, and to use his words, the sooner he pulled up stakes the better. Seeing that the Illinoisian had it his own way, and that my young friend was drinking it all up as law and gospel, I ventured to ask the former somewhat as follows: What do you get a bushel for your corn in Illinois, average price? Not obliged to sell it. Well, if you do sell it? Twenty-five cents at depot. Sometimes you cart it in the mud? Ye-e-s. You give to us forty? Not always. It is notorious that our river valleys grow as much corn to the acre as you claim for the prairies—eighty bushels. Well, I give it up and allow you an average of forty bushels.

Corn raised here, I mean the good old yellow corn of Massachusetts, is worth one dollar per bushel, cash, one year with another. I had now, as you perceive, got $40 per acre against his $20, to say nothing of the extra labor of harvesting, with the privilege of getting the shakes to boot. It is easily cured with quinine, never entirely. I hope sometime for leisure to discuss more fully a market at your doors, or from 1,000 to 2,000 miles off. I mean with the privileges and comforts of life taken into consideration; not cabins, against our dwelling-houses, not a prairie sea, with hardly a tree or a stone for fencing, against our churches, school-houses and stone walls; not mud and lime water, against our pure and limpid springs and fountains, gushing from a thousand hills.

With nothing but the kindest feelings toward the great West, a Massachusetts farmer, in emigrating there, in this short life sacrifices too much altogether—the home he loves—the exquisite feeling that thrills every noble heart, of sleeping with his fathers. The reflection that, comparatively, the tears of strangers only can water his grave; certainly not those bound to him *earliest*, by the heart's *best* affections, in life's happy morning. Never did I see this feeling so strongly developed as in my recent visit to California. The eyes of those who went from us would fill in a moment when I told them of home, sweet home. When once addressing a Dutch farming population on the Tunnel Railroad, between North Adams and Troy, N. Y., urging upon them the duty of subscribing to the stock, both for the saving in the transportation of produce as well as prospective value of the stock when the tunnel was done, I perceived, after an hour's effort upon dollars and cents, in looking round upon my audience, that for all practical purposes I might as well have been talking to an iceberg. "Bury me with my kindred is God's inspiration," I exclaimed. Every phlegmatic Teuton or son of a Teuton raised his head and opened his sleepy eyes. "Where are your children? Aye, and your children's children? Why not give them the means and facilities of staying at home? What are you doing with this part of God's own vineyard *but diminishing* every day in population, as appears by your own census? You are going to the wall with your homes old and dusty. In scripture parlance, you seldom marry or are given in marriage. Have you forgotten to read the book of Genesis? Do you wish to hear of the death of a beloved son, daughter, sister or brother, long after they have been consigned to native earth, always in some distant State; or to keep them on your farms till you or they arrive at that shadowy valley where the soul's yearning is for its loved ones, on its transit to eternity, to close the eye upon Heaven's light?" There was too much of the "Auld Lang Syne" of the immortal Burns in this. The subscription was forthcoming.

If then we love our own homes and kindred, why should we not manage to keep them at home? Let those who come to us from abroad, the German or the Scandinavian, people the West. We have given enough of our blood and character there until we can restore ourselves here. We must combat the mistaken idea that, after weighing the whole matter, pro and con, the West is superior to New England, especially Massachusetts, if we wish to spend our lives in health and comfort.

We must adopt a higher standard of education, physical as well as mental, admitting the great truth, that the latter depends for its vigor and life *upon the former.*

We must make our boys work on the soil six months of the twelve. They will probably learn more at school the other six months than if they attended the whole year. Give them patches of land to cultivate on their own account, with all they can realize above cost and expenses. Give them a premium when they deserve it, but make them sell their own products in market. Give your daughters plots of ground for flower-beds, in the same way; *drive* them, at least two hours in a day, from the stinted atmosphere of the house and piano, to open air and light, to digging in mother earth, developing thereby the future mothers of our race. Introduce the most improved implements of husbandry, on the farm and in the house. Do not wait—lead your neighbors if possible.

Improve your stock; don't keep a poor animal of any kind. Grow roots, fruits, grains most productive and nutritious. I raise upon two acres in Fitchburg almost enough to support a small family. Let us grow such crops as will pay best, or at least have the best probability of a good return. If you make your farms attractive to men of education, of refined taste and manner, by flower gardens, fruit and shade trees, you give to your family a standard for mental culture. The want of education is so plainly written that the most stupid cannot fail to preceive it, and without it the birds of the air and the beasts of the fields are our superiors.

The farmer should look upon his occupation as a profession, fully equal to Divinity, Law or Medicine. It is in fact superior. They cannot live without him; but he can live without them.

Let his sons, who are to have his old homestead (for with scientific culture there will probably be enough for all), that dear spot, filled with shrines the heart hath builded, not only represent the intelligence and refinement of the present generation, but the simple manners, homely virtues, pious trust and warm-hearted hospitality that characterized his ancestry. With a practical education, let him be a good chemist, and he is sure to be a good farmer.

Although I have attained the limit which I prescribed for myself in this address, I must crave your indulgence to say a word about English and Belgian agriculture. Belgium with only 11,373 square miles, yet sustains a population of 5,000,000, and is made by the hand of labor a garden. In my two visits there the past year, I was unable to see what possible advantages it had over Massachusetts, save a little larger territory and beds of coal—in fact in the broken character and face of the country and its soil, as in England, especially in the county of Kent, with the same cultivation, I could almost imagine myself at home—as England and Belgium are confessedly so similar in soil and climate. I will describe a visit which I made to Benjamin Brown, Esq., a tenant farmer in Tunbridge, Kent. I told him that I came for information, and was welcomed with that warm English hospitality so grateful to a stranger. He insisted upon my making his house my home.

When his boys returned from their work, the daughters and mother had prepared an excellent supper. I found them all full of culture and taste, devouring with avidity such information as I could impart about our country. I forgot what became of the evening in this lovely family, till I was asked to join in a hymn of praise to God in one of our well-known airs. Then one of the daughters took the organ as easily as she had taken the frying pan three hours before. After kneeling in prayer I was ushered to my sleeping room, " neat as wax," with quaint old furniture. Before I dozed and slept I came to this conclusion, that if five righteous men could have saved Sodom, England, with all her sins, was still safe.

Cock crowing and turkey gobbling were my breakfast bell; afterwards came the routine of the evening prayer system everywhere; the morning hours, measured and divided as our own existence is spanned by an Almighty Power.

One of the daughters invited me to visit her flower garden. I hope if ever she visits me it will be in the winter.

Mr. Brown now took me over his farm. Like most English soil it had the curse of entail upon it. But as it was much run down when he took it, he succeeded in getting a lease from his landlord for thirty-five years, for £150 per annum.

To make the farm more profitable, he had himself expended during the eight years, more or less, while he had occupied it, £3,000 more, so that calling his investment five per cent., his rent would be £300, or $1,500 our money per annum, which does not include loss or betterments at the end of his lease. His farm was divided as follows: to wit, twenty-five acres were growing hops, with old woollen rags for manure; forty acres wheat, crop about thirty-five bushels to the acre; thirty acres woodland, on which he could only cut underwood, to be appraised at the end of lease; fifty-five acres meadow or hay land and pasturage. The cattle which he raised were Shorthorns, of which you see more both in England and Ireland than of other breeds; his horses were the heavy Flanders, or Belgian breed, which he used on his farm almost exclusively; his sheep were a cross of Leicester and Cotswolds, yielding a fleece from eleven to thirteen pounds; though he regarded the South Downs, with a fleece of only six to seven pounds, best for light soils, like much of his. In manures and composts there was nothing he did not resort to. His crop of grass was excellent. In his haystacks, for he had no barns except for his cattle, I noticed that he would first put a layer of wheat or oat straw, then of hay, which was cut down and fed out together to his stock.

Without wearying you with more details, what do you think was the income of this one hundred and fifty acres, not so good by nature as the Wilder farm, not three miles from where we are sitting? £400, or $2,000 per year, over and above rent, exorbitant taxes, interest and cost of carrying it on, while the whole secret of success was system, industry of his family and making everything tell. Mr. Brown, in the after part of the day, was too busy to go with me to Tunbridge Wells, five miles, and sent his daughter with the carriage. In closing, I can only wish that the farmers of this society could have been there instead of myself.

Massachusetts, with so small a territory, only 7,000 square miles, demands of her sons the cultivation of every acre; every facility, too, for a full development of all her resources; the quickest, cheapest transit in her every section for intercommunication with the produce of her farms and manufactures.

We must, in short, re-people our acres if we continue to maintain our noble prestige and political pre-eminence. Unless we do this, by the growth of our Western sister States, quadruple and quintuple in territory, we must in the end, even with our noble race of men, pale away to insignificance.

In short we must afford any and every facility to our people, and do away with every obstacle that stands in our path. We can in this way, and in this way only, sustain the most dense, active, industrious and therefore virtuous population in the whole sisterhood of States.

CATTLE HUSBANDRY.

Address before the Hampshire, Franklin and Hampden Agricultural Society.

BY RICHARD GOODMAN.

In the year 1624, in the month of March, Edward Winslow, one of the most enterprising members of the Plymouth Colony, who had been sent to England by his associates, the "undertakers," successors to "The Company of merchant adventurers," returned, bringing with him an important accession to the Pilgrims—three heifers and one bull, supposed to be Devons, the first neat cattle that came into New England, and the beginning of those importations from which the dairy and working stock of our forefathers and ourselves have descended. In 1636, twelve years subsequent to this first importation of cattle, cows were worth £25 each, and of course at such price were not then used for eating, yet a quart of milk could be then bought for a penny. "One Taylor of Lynne," according to an ancient chronicle of those days, "on his passage over with a cow had sold her milk at two pence the quart, and after hearing upon landing a sermon upon extortion, went distracted."

The races of cattle existing in England at the period of the settlement of this country by our Puritan ancestors comprised not only the distinct classes of middle-horned, long-horned, the Durhams or old Shorthorns and the polled or no-horned cattle, but grades or crosses from the best stock of Europe, including the Dutch and Alderney or Channel Island cows, and cows from Flanders, Normandy and Brittany, which were then noted for the quality of their milk. Centuries prior to that period the English made predatory excursions into France and adjacent countries and brought back not only men to be ransomed, and fair women to be wived, but cattle to be eaten and to adorn the parks and domains of the nobility. Just one hundred years antecedent to the Mayflower's advent to the inhospitable shores of New England, Henry VIII., king of old England, sent an army into France and took many towns and castles; and no less than 14,000 head of neat cattle, with sheep and swine, were plundered from the French and brought into the south part of England, along the coast of the English Channel.

Like excursions were made into Scotland by the same king and into Ireland, and multitudes of cattle from each country were brought into England and disposed of to the owners of the land and crossed with the English cattle then existing. So that at the time New England was settled, and during the emigration for years after from the various parts of Old England, there were in the latter country races of cattle combining the best qualities of all known animals, each county or district possessing a kind peculiar to it, and the people going from any particular county took with them the cattle belonging to it. In the north-west of England the longhorns were most prominent, and the emigrants from the counties of Westmoreland, Cumberland and Lancaster brought over stock of that description. This herd of cattle were distinguished by a great length of horns, which frequently projected nearly horizontal on either side, and sometimes hung down so that the animal could hardly reach the grass with its mouth, or met under the jaw so as to lock the lower jaw. It was this breed upon which Robert Bakewell, the great improver of long-woolled sheep, exercised his art and brought them to such perfection for the grazier and butcher.

Early in the present century a few of the improved breed were imported into Kentucky, but they were not received with much favor, and the Shorthorns have driven them out. The middle-horned cattle, including the Devons and Herefords, were favorites of the early settlers, and as the people from the districts in which these cattle were most numerous came in greater numbers to our shores than from any other region of the mother country, they were brought in large numbers. The Devons especially were imported largely into Massachusetts and Connecticut, but the colonists of the latter State gave them the most decided preference over all others, and to this day there are more pure Devons in that State than in any of the United States; and at the recent New England fair held at Manchester, New

Hampshire, as fine specimens were exhibited as have ever been bred.

The county of Suffolk in England had for centuries been celebrated for its dairy produce, which was chiefly obtained from a polled breed of cattle, the prevailing color of which is dun or pale red, from whence they were and still are known as the Suffolk Duns. In the days of Henry VIII., they were held to be royal animals, and the effigy of a fine cow of this breed was painted on the national flag of England. Many of this race were brought into Massachusetts by its first settlers, and introduced into the counties of Norfolk, Essex and Middlesex, and from thence into Worcester, whence the known superiority of those counties in dairy products.

As the modern "Shorthorn" was not in existence until after the improvements upon the old herd by the Colling brothers in and after 1780, it was only the old Durham cattle that came over with the emigrants from the north-eastern counties of Northumberland, Durham and York, and many cattle from these counties were brought into the counties of Essex and Middlesex in Massachusetts, and crossed to the benefit of all herds with those then there, or subsequently brought there.

The Normandy and Alderney cattle were very common in those counties of England opposite the coast of France, and were noted for producing an excellent quality of milk, and were brought over in large numbers by the early emigrants from those counties. In addition to these well-known breeds, other varieties of cattle not so well known to us, and most of which are now extinct, being either merged into other breeds or allowed to die out, were brought over, among the most prominent of which were the Leicestershire and Sussex the Gloucestershire and Somersetshire cattle of England.

The Welsh, also, who emigrated so strongly into Rhode Island, southern part of Massachusetts and eastern part of Connecticut, brought with them their Anglesea, Glamorgan and Montgomeryshire cattle, dark, hardy, vigorous and easy to fatten. The Irish (Puritans from the north of Ireland) and the Scotch, who first settled the islands of Martha's Vineyard and Nantucket, brought with them the Argyle and Ayrshire cattle, and other herds peculiar to the places the emigrants came from, and the Danes and Swedes introduced some of their own country stock. By the year 1640 the price of a cow had fallen to £5, and in addition to the picked men and women from the old country, we had a selected assortment of cattle in New England, and if the latter had been as well attended to as the former were able to attend to themselves, we might have to-day animals superior to all others for useful qualities of dairy and shamble. Beside these direct importations into New England, the cattle of Berkshire, Massachusetts, came partly from the Hudson River, and included many of the Dutch or Holland stock. These latter were imported largely by the early settlers of New York. The Huguenots also brought French cattle into the Carolinas and Maine, but as none except a few breeds have been kept distinct, we call the admixture wherever found "homebreds or natives."

Like their owners they have become Americanized, and to all, the climate, bracing air and fresh pastures have proved beneficial—they have become more docile than their progenitors, more healthy and hardy, and when taken care of properly, large milkers, great travellers, and able to put on fat with ease, making them excellent stock for the dairy, the grazier and the butcher, as well as fine working animals on the farm.

The experiments of Colonel Zadoc Pratt at his dairy farm in New York, with fifty native selected cows, for a period of three years, showed that in the production and quality of milk they equalled the same number of selected Ayrshires in Scotland, and would probably have found no superiors in dairy qualities among any of the improved breeds. Why, then, you may ask, are not these cattle just what the dairymen and farmers in New England want, and why trouble ourselves about the Shorthorns, Ayrshires, Jerseys, Devons, &c., concerning which so much noise is now made, and for which such large sums are demanded and obtained? The difficulty arises from the laws of breeding, which are as certain as all the other natural laws, and cannot be cast aside any more than we can pretermit the laws of climate, the effects of feeding, or any other causes which change the size and qualities of animals. The sins of the fathers (and mothers too) are visited upon the children, and the deformities, the bad qualities of the preceding generations, are more apt to crop out in the descendants than the good ones in mixed races of impure stock, and therefore we find our native cattle are generally faulty in form, slow in maturing, poor handlers, heavyboned and unequal milkers. Even if the best had been culled out from time to time during the preceding two and a half centuries, the law of diversity would have precluded the formation of a good breed with hereditary qualities of transmission, unless the bulls had been of pure descent, and such breeding continued to the progeny.

Owing to their variegated origin, the natives have unfixed hereditary traits, and even those possessing desirable characteristics cannot be relied on as breeders to produce progeny of a like excellence. "Instead of constancy there is continual variation and frequent breeding-back, exhibiting the undesirable traits of inferior ancestors." In all thoroughbred animals the good qualities are concentrated; that is to say, they breed alike from sire to son, mother to daughter, and so on down to indefinite generations, and they infuse their blood so strongly into their offspring that the *fixed* characteristics of the pure-bred animal will in time modify and eradicate the irregular qualities of the mixed stock. Such was the origin of the improved Shorthorn, of the Ayrshire and other known breeds; and Col. Jacques of Massachusetts, came near rivalling his English prototypes in producing a breed of "Cream-pots" from his imported Shorthorn bull Cœlebs, and would undoubtedly have succeeded in establishing a fine tribe of cattle if he could have continued his breeding long enough. The native or even the half pure-bred bull produces inferior instead of improved progeny; because in the case of the first all the inferior qualities of the ancestor are subject to transmission, and as to the other one-half, or rather more than that—as the bad qualities, both in two and four footed animal nature, since Madam Eve's transgression, are more likely to crop out than the good ones, when opportunity is offered. I don't wonder at the Irishman's explosion after being annoyed by the frequent jiltings of his lady love, "Oh! Father Adam, why didn't ye die with all your ribs inside of ye!"

Our ancestors were at great pains in settling their colonies; they themselves were mostly persons of high intelligence, knew what good farming was and how to choose their stock, and brought over the best animals they could find and kept a sharp lookout for good milkers. But their descendants failed to keep up their interest in the matter, and for want of good selection of calves, good breeding, and good care and abundant feed during winter, the native cattle of New England as a whole gradually fell off, and it was early noted by prominent agriculturists that there must be fresh infusions of improved blood to keep up the cattle to what they had been. Early in the eighteenth century cattle were imported especially for breeding purposes, but it was not until the present century that such importations were regularly made ; but from 1815 to the present period importations of thoroughbred neat stock have been carried on with regularity, and in 1868 the amount of importations rose in value nearly two and a half millions of dollars, and in 1869 probably more. The breeds from which selections have been made are the Shorthorns, the Devons, the Herefords, the Ayrshires, the Jerseys, the Galloways, a few Dutch by Mr. Chenery, a few Brittanics by Mr. Flint and occasionally a Kerry cow from Ireland.

It is not worth while for me to give a history of any of these breeds in detail, and I will only repeat what you all probably know, that what are styled " Shorthorns " are improvements by long continued breeding on a large, roving and rather coarse cattle known as the Teeswater breed, so called from the river Tees, a stream dividing the counties of York and Durham in England. These Teeswater cattle were the earliest dairy breed of which we have any account, and their excellence at the pail was an inherent quality, which all the long after-course of breeding to produce beef has not eradicated, and which still characterizes some families and tribes of the improved Shorthorns. The Colling brothers, Robert and Charles, are pre-eminent as the earliest breeders of the modern Shorthorns, but great improvements have been made since their day, and none of these animals could successfully compete with the prize winners of to-day in England, nor with the herds of Messrs. Thorne & Sheldon, and the unequalled herd of Messrs. Wolcott & Campbell, of New York, and Mr. Cochrane, of Canada. There are probably now in the United States 7,000 to 8,000 well-bred breeding animals of the Shorthorn family, 6,000 of which are females ; and nearly all those in New England are of good milking families, whilst those of the West are more famous for beef making.

The Devons, which were largely introduced into New England by the early settlers, were a very early race in England, but have been much improved by careful breeding. They are of medium size, color invariably cherry red, not very heavy in the brisket, and being narrow between the shoulders, are enabled to move briskly and are therefore adapted to working under the yoke. They come early to maturity, but are excelled at the pail both as to quality and quantity by other breeds.

The origin of the Ayrshire is even yet a matter of dispute; but recent criticism leads to the conclusion that the improvements in this breed were effected by a cross with compact Shorthorn bulls, descended from good milking families. Of late, the Ayrshire has increased in popular favor in this country, and if it continues to improve in size and quality of milk, it bids fair to take possession of our dairies, especially where quantity of milk is most desired.

The Alderneys, or, as now designated, the Jerseys, were well known in England a century and a half ago, are mentioned incidentally in the literature of that day as good milkers, and are supposed to have come from Normandy into the Channel Islands. They have been improved there, especially in the Island of Jersey, one of the three, by the severe laws prohibiting other cattle coming on the island, and by close attention to selection and breeding. Many good specimens were brought to this country from time to time by captains of vessels half a century ago, but it has only been during the past twenty-five years that they have been largely imported, and we now have probably as fine Jerseys as are to be found in the world. As hereditary butter-makers they are unequalled, and if we can improve their shape, give them more size and adaptability to take on flesh, they will prove more valuable than they are now, and be desirable for any class of farmers.

The Herefords, which are creeping along in the public estimation, especially as working cattle, date their origin far back in English history. They were originally deep red, now usually red with white face, throat, belly and sometimes backs, and once in a while one almost white, with red ears, is found amongst them. As a dairy cow the Hereford has but little reputation; as a working ox he is equal to any, and also as a beef animal.

The Dutch cattle are an ancient breed, and transmit their characteristics to their progeny with regularity. They are good at the pail, though the milk is said to be inferior in quality, have a large, compact frame, are invariably black and white in color, with short horns and hair.

I doubt if either the Hereford or Dutch will to any extent usurp the place of the Shorthorn ; and certainly for the improvement of our native stock, the fineness and general symmetry of the latter will always give it a preference among skilful breeders, and the quality of its milk cause it to be desired by the dairyman and farmer.

The dairymen of New England cannot afford, nor can the ordinary husbandmen, to shift their present stock and supply its place with any of these thoroughbreds, but they can select the best of the native stock and breed to such bulls of pure descent as will not only keep up the present average goodness of our dairy stock, but improve the progeny to an indefinite extent. As to what breed should be used for this purpose every farmer is his own judge, looking to his needs and situation ; but considering all things, I should prefer the Shorthorn, selecting the compact, short-limbed, milking families bred in New England, for the reason that they add to the best qualities of the native stock, increase their size and render them not only valuable as dairy animals, but profitable to the grazier and butcher when thrown aside as poor milkers or over-aged.

We can hardly estimate the importance of thus improving our stock by attention to breeding, considering it only in the light of increased weight of cattle and the value thereof in money. Look for a moment at the great improvement of live stock in Great Britain since the Collings started upon the Shorthorns. Then the average weight of beef cattle at Smithfield market was 370 pounds each. In a report of a committee of the House of Commons in 1795, it was stated that since 1732 English cattle had increased in size or weight, on an average, a quarter or twenty-five per cent., making the weight at that time (1795) 462 pounds. Thirty years later we find 656 pounds the average, an increase of nearly forty per cent. in thirty-five years, and instead of being fatted at five years they were considered ripe for the butcher at four, thus saving a year's attendance and feed, equal to another twenty-five per cent. in weight.

According to the census of 1860 there were in the whole United States and Territories about nine millions of milk cows, two and a half millions working oxen, and fifteen millions other cattle ; nearly six millions of these milk cows and one-half million of the working oxen were in the Northern States. Give the proportional improvement the English stock has received to the milk cows and fattening stock of the United States, or even to those of New England, and one-half or one-third to their weight, ripen them for the butcher at four years of age, have produced from them a quality of calves superior in every respect to their dams, and we at once make a long stride on the road not only to individual but national wealth. To do this we must ignore half-bred bulls, use only those of pure pedigree and of the right form and size and proper age; and persist in selection and breeding, and not give up, as a majority are disposed to do, if any streak of ill-luck befalls the enterprise at the outset. Most if not all of our local societies have refused to bestow premiums on grade bulls, and the State Board of Agriculture will soon make it imperative upon all to do so, leaving it to the farmer, if he pleases, to raise and use such animals, but depriving him of the opportunity of getting premiums for thus hindering the march of improvement.

A good deal is said at our agricultural meetings about certain local breeds which compare favorably with the imported, and because they are not recognized among the thoroughbred classes, their owners feel aggrieved. But the fact is, no breed can be considered established so as to insure a hereditary transmission of good qualities and an inability to return to evil ones until many generations have been passed, and as we have breeds which two centuries have endorsed and it would take several more to surpass, it is hardly worth while to attempt a competition. Had we the length of life of the old patriarchs when courting was a seven years' pastime, and other duties of life proportionately elongated, we might indulge in the luxury of starting new breeds and expect to see the experiment brought to a close, but with our shortened period of existence and migratory habits, we must rest content with what has been done for us already. But we need not be satisfied with merely improving our native stock. We can have in addition a few thoroughbred animals and strive to improve upon them and raise a breed of superior cows for the dairy, at the same time educating ourselves into a more vivid interest in our occupations and add to the material improvement of the stock of the country.

When therefore there is a bull of improved breed in the vicinity, let each farmer who can afford it get one or more females of the same kind, and the natural competition in breeding and raising such stock will soon produce an improvement upon the sire and dams, and put money in the owners' pockets.

Mrs. Glass's first receipt for cooking a hare was—to catch it. Having now got our animals, the next question is, how shall we take care of them? We manage our bulls badly. We either let them (if scrubs) range about at will, or if pure bloods keep them up, fed high and not exercised, so that their usefulness is over before they attain maturity, and their progeny wanting in constitution. Our Puritan ancestors did better. We find no mention of horses among them until 1644, and it was not an uncommon thing to ride on bulls. When John Alden went to Cape Cod to marry Priscilla Mullins, he covered his bull with broadcloth and rode on his back. When he returned, he placed his wife there and led the bull home by the ring in his nose. Longfellow, in his poem, relates this incident, but substitutes a milk-white steer for the bull—a poetical license, but a departure from the true history. Another incident of the story was, that Alden at first went to ask the hand of Priscilla for his friend, the renowned Capt. Miles Standish. The father referred him to the daughter, who listened with attention, but fixing her eyes on Alden's handsome face, said, "Prithee, John, why do you not speak for yourself?" Such frankness John could not resist in those good old Colony times!

But if we don't feel inclined to ride on bulls we should early subject them to the yoke and harness, and work them double or single. Reasonable amount of work will keep them in better health, prolong their usefulness and improve their progeny; a first-rate place for the "gentleman," as I heard a young woman style the head of the herd, is in the horse-power, where he can earn for two hours a day his living and improve his health by cutting wood, thrashing the grain, chaffing the hay, &c. He soon gets accustomed to the work, and bellows for it as little boys are said to do for sugar-coated pills, though I never heard of the latter making the outcry but once. A pair of Jersey, Devon or Ayrshire bulls make a neat team to handle, and become very docile, and in fact regular work will take the "old Harry" out of any animal. It is only idleness that breeds vice, and for idle horns and hands his sable majesty generally finds something disagreeable to do. Martin Luther is not the only person who instead of dying a natural death has been excommunicated by a bull!

In our treatment of domestic animals, it is best to compare their condition with our own, and *vice versa*, and we shall find that in the main they need about the same care, attention and requisites that we do. I have also found in relation to horses, for instance, that when there was any doubt as to their need of drying, rubbing and clothing, after a long and hot drive on a chilly day, I had only to put myself hypothetically in the same condition, and all doubts vanished. So as to eating immediately after quick work, or being fed irregularly, or driven on a full stomach, the same inconveniences or evils that would be felt or result in our case would so act on the lower animal, and what was good or bad for the man was good or otherwise for the beast. We often hear about cows being mere machines, as if their whole duty was to stand in a stall, be crammed with all they could eat and drink, milked by machinery if possible—treated in fact just like a pin manufactory, bars of metal being thrust in at one end and pins coming out at the other. I believe with Mr. Beecher, that the cow is the saint of the barnyard (and if homeliness is necessary to goodness, our native cow has this prime qualification), the very ideal and pattern of a saint, giving her whole strength to lacteal benevolence, patient, gentle, guileless, contented, and instead of being in any manner ill-treated, she should be worshipped Let us keep a niche in our hearts for St. Durham, St. Ayrshire, St. Jersey, and St. Homebred, and a memory for their capacious udders, patient disposition, mild eyes, home-loving desires, and the pure milk, which, like that of the "word," is conducive to godliness, and we shall not err in our care of these harmless natural saints.

A young lady who was rebuked by her mother for kissing her intended husband, justifies the act by quoting scripture, "Whatsoever ye would that men should do unto you do ye even so unto them." And if we would carry this golden rule into not only our treatment of each other, but our dumb brethren and sisters, we should but do justice to their merits and our own duties as their conservators. Our cows need, equally with ourselves, good shelter and food, proper ventilation, pure water and plenty of it, clean bedding and daily exercise. It is all folly to think of keeping them up in stables night and day, even in the winter, and expect health in themselves or offspring. You may by such a course for a brief season increase the production of milk, but it will be at the expense of the constitution, and in a short time the animals and the race will run out.

The two most common modes of stabling cows in practice with us, are in stalls and stanchions. The former method is best for large animals, and if the stalls are about seven feet six inches wide for two cows, the mangers not lower than twenty inches from the floor, the platform on which they stand raised six inches above the walk in the rear, the cows can be secured with chains and be kept clean and comfortable. But the most usual way among dairymen is putting in stanchions, as it insures cleanliness in all cases, and if the platform is of the proper length, and if the animals are turned out a sufficient time daily, and sawdust or other material put well forward, so that they can get up and down easily, they seem to suffer but little inconvenience. In laying the plank when such stables are constructed, they should run across, and not up and down, as in the latter case they become sooner smooth, and, when insufficient bedding is under the cow, she slips and strains in getting up. It is complained that under the restriction of stanchions the cow cannot scratch herself. A well-bred cow don't want to scratch at improper seasons,—she learns like flea-bitten denizens of warm climates to bear her itchings until a fair opportunity offers, and then like them she goes in for "a good time." Sydney Smith, the celebrated English divine and humorist, had in his farm-yard a scratching board for every animal, so that the ox and the pig could be accommodated; and if our cows are kept cleanly, washed occasionally with soft soap and water or with carbolic acid soap, curried, bedded and turned out daily, with opportunity for rubbing, they will not complain of the confinement of the stanchions.

This of course is not the most humane way of keeping animals, but taking the economy of the farm into consideration, the costliness and quality of hired labor, and our own tendency to slovenliness about our barns and yards, it is the most likely way, with the least injury to the cows, to insure them and their production cleanliness. A person asked an Irishman why he wore his stockings the wrong side outwards. He answered, because there was a hole on the other side. So in almost everything we do, there is a gap left on one side, and the true mode is to leave as small a one as possible. It is hardly necessary to urge the importance of a plenteous supply of pure water for cows, to an assemblage of milk producers, for they have learnt the necessity of that liquid both for the inside of the cows and the cans ; and running spring water is becoming a requisite to the cheese farmer as well as the milk seller, the milk in both cases requiring sufficient cooling to destroy the animal heat and flavor before transportation to the factory. But in ordinary farming a great loss results in waste of manure, time and drying up of cows, by driving them to a distance from the yard. The rain shed by the roofs will supply all the animals sheltered under them, if preserved, and the simplest mode is to dig a well in a spot near by, and yet so placed as to preclude the washings of the yard dripping into it, and turn into it the leaders from the roof troughs. You thus have water in your well from each end, and of a much better quality than either rain or well water alone. The best eave troughs for a barn are those manufactured by machinery of wood, scooped out of plank, without joint or any place for leakage, and they are cheaper and more permanent than tin.

There is no doubt that our native cattle owe their deterioration greatly to want of proper nourishment. The late-cut hay of our forefathers, with no succulent food, and no variety, left its traces upon the stock as sensibly as did insufficient shelter, and we owe to such treatment not alone the inferiority in size but the malformations, excess of bones and the like, which distinguish the native cows. It is a part of the science of human nature that all the nations that live miserably are ugly and ill-formed. We know that the man who lives in a marshy district undergoes a chronic poisonous influence which destroys his health and produces hereditary deterioration. So insufficient nourishment and the *exclusive* use of certain articles of diet, as maize or potatoes, produce morbid results of an endemic character in the human system.

The Esquimaux, who live altogether on train oil and flesh, are dwarfed in body and mind. The Irish, originally one of the most beautiful of the Celtic races, by partaking almost exclusively of the potato as food, have, among the poorer classes, lost all their beauty of feature and form, and it has been observed that in some of the counties of that country where poverty was the greatest, and nourishment most insufficient and exclusive, the inhabitants have become dwarfed in stature in the second generation. By an intermixture with other blood in America, sufficient food and a variety of it, we already discern a great improvement in the appearance of the children of the Emerald Isle amongst us, and the future will witness a yet more wonderful transformation. The Chinese undoubtedly owe their ill-favored countenances to an exclusive diet, meat (of large animals at least) being a great rarity with them; and we Yankees have fallen away from the luxuriousness of our English ancestry, by too close adherence to pork and pastry, irregular periods of eating, and allowing our children to be brought up on the indiscriminate food we put on our tables,—gorging them with sweets instead of giving them muscle and good constitutions by a liberal allowance of oatmeal and bean porridge, good bread and butter, a little meat, vegetables in abundance, and "*no pison things*" *whatever.* There is no country in the world where quack doctors and dentists flourish as they do here, owing principally to bad diet, and the hereditary tendency to decay bequeathed by our parents, and noticeable in the early fading of the beauty of our women, as well as in the decay of our masticators.

From the formation of the cow we learn that grass (tender grass) is her natural means of subsistence. And the nearer we can get our fodder, whether hay, straw, cornstalks or the like, to the consistency of her natural food, so much the better for her and for us who live by her. If she is to be kept on hay only, it should be cut early, not overdried, and secured without the sugary quality being washed out, which is an important element in her food. When grass first springs above the surface of the earth, the principal constituent of its early blades is water,—as it rises higher into day, the deposition of a more indurated form of carbon gradually becomes more considerable,—the sugar and soluble matter at first increasing, then gradually diminishing, to give way to the deposition of woody substance, and it is before the last change, before it shapes into seed, that the grass should be cut.

But the difficulty of keeping a cow on hay alone, and keeping up her quantity of milk, is, that it is not as tender as grass, and she has too little time for rumination, so much being taken up in squeezing it between her jaws preparatory to its being swallowed; consequently, she gets tired of the operation and don't get into her more than is necessary for her maintenance. This must be at least fifteen lbs. of hay a day, and you may conceive, if you have ever tried to eat a pound or two of dry bread without water, the difficulty of the operation. Now in addition to a mere living, the cow must supply a certain quantity of milk secured from the food she consumes, and perhaps is at the same time nourishing the future calf. The more food you can make her eat and digest, the greater your products from her. She milks from the mouth. She is not a breech-loader, but the ammunition is put in at the muzzle. Besides, after swallowing her food, you want to give her time to pursue her chief end of existence,—rumination,—without which digestion cannot go on, nor her health and condition be maintained. A variety of food will help to keep up her appetite, and this is the main use of turnips and other roots. For I believe with John Johnston, that four quarts of corn meal will go farther than 120 lbs. of turnips, and that corn can be raised with as little labor, taking feeding and everything into consideration, as roots, and we have the cornstalks for fodder,—the very best food, if properly cured, and fed, cut and moistened. But every farmer should raise some roots—the mangel-wurzel beet or the sugar, and carrots are the best,—for an alterative and appetizer, as animals feed on hay and grain alone will get cloyed, and fail to eat as much as they should. A cow, to sustain herself alone, will eat one fifty-fifth of her weight in hay. To nourish the calf, an additional quantity of food must be administered daily, as the dam approaches maternity. To yield twenty-two quarts of milk, producing twenty-four ounces of butter, the cow must be compelled to eat one hundred pounds of hay, as that quantity is required for twenty-four ounces of fatty matter. Here you see why we have so many stunted calves and broken-down cows every spring. The cow has not had such variety of food as her situation demanded.

And it is not only in the winter feeding that we need observation and correct conclusions, but also while the cows are at pasture, if we desire to keep up their production to the utmost and continue their improvement. To this end, the pasture should be good, and, if not naturally so, should be improved by ploughing and re-seeding, or top-dressing, or in some way cleaned and fertilized. Cows should be enabled to fill themselves without wandering long distances, for quietness produces not only digestion, but secretion of fat, and increases the richness of the milk. In many places it will pay to stable the animals most of the day during summer, especially during the hottest part, and soil them from the rich meadows near the barn, from which several crops can be taken in one season, by high manuring,—top-dressing. But cows in confinement need more change of food than when at pasture, and even at pasture observant dairymen often detect a falling off of the casein or curd adapted to cheese making, and a larger production of fatty matter yielding butter, or *vice versa.* Sometimes a change of pasture will remedy the difficulty, or it may be necessary to supplement the feed of grass with artificial food, or even hay, the latter decreasing the curd and increasing the butter, whilst potatoes, beets, or oil-cake will increase the cheese-making constituents. The superior influence of our natural pastures is owing to the variety of grasses and other plants contained in them, and it is therefore desirable, when they need improvement, to do it by sowing artificial fertilizers on the top,—plaster, bone-dust and the like,—instead of taking them up and re-seeding to one kind of grass only.

WOMAN AND HOME SCIENCE.

From an Address before the Hampshire Agricultural Society.

BY H. W. PARKER.

If science be good outside of the farm-house why not inside? If it be a blessing in agriculture, why not in that which may be termed *domiculture*—the great art, the hundred arts, of housekeeping? This has been acknowledged indirectly in our agricultural fairs, much of the interest of which depends on the lady exhibitors.

Such an application of science is especially important to the farmer's wife, not only because she has peculiar work to do, but because she only, with few exceptions, is supposed to have strength and wisdom to do her own housekeeping,—is not helplessly dependent on Celt or Chinaman.

Home science is an appropriate study for woman, and certainly would be a great aid and joy to her in her toil. The daily round of in-door work is often felt to be discouraging and degrading. Life seems to be wasted in endless cooking, scouring, mending. High aspiration is quenched in a sea of dish-water. And every occupation must be degrading where there is not a noble participation in it of the mind and soul.

There is such a science. Knowledge so applied is brought to view in various books. And there are special volumes, such as "Chemistry of Common Things," "Familiar Science," and one entitled "Household Science," a book of 470 pages, treating of light, heat, vision and colors; air and ventilation; food, its principles, forms, preparation, preservation, effect and nutritive value; cooking utensils; cleansing processes; and, finally, of poisons. To such a book should be added volumes on domestic medicine, physiology, household architecture, gardening, insects, the education of children, and the beautiful arts. A few books, however, are of comparatively little avail, without systematic education and laboratory practice. Few have the genius to educate themselves.

The common objection to everything of the kind is, that practical knowledge is enough, without book knowledge. Some one may say: "All this science is stuff; my grandmother did not know *ox*ygen from *stear*ine; she did not know 'sal soda' from 'sal ammonium,' or any other Sally; but she could cook such doughnuts as you never saw." A sufficient answer to the excessively practical people is the instance of the doctor who killed a fever patient with codfish, because another fever patient had secretly partaken of the same and recovered. It was a very practical inference he drew. Of course, science alone will not make a housekeeper. It will not make a physician. The medical student needs to practise with an old expert, as well as to attend lectures and read books.

Another objection is, that much of this science is but the learning of hard names for common things. It may be said, why not know pearlash and saleratus simply as such, not as carbonate and bicarbonate of potash? The answer is that potash is a powerful alkali; it must be injurious in considerable quantities; and the same, to a less degree, is true of soda. If the right names were used, what lady would have the face to say to her guests: "Shall I help you to some potash bread or potash cakes?" Scientific knowledge is a knowledge of things and their action.

First, therefore, a scientific *in-door* agriculture would save us from many hurtful practices. The use of fine flour, from which the phosphates have been removed by bolting, is another example.

Secondly. Scientific knowledge would influence us to carry out the floating knowledge we already have. We do no feel a truth and act upon it, till we thoroughly know it. We know, for instance, that the effluvium rising from the waste-pipe of the kitchen sink is noxious, and so likewise when the sink-washings discharge into the open air near a house; we half know that all this can be remedied by a closed drain and closed cesspool, with a pipe leading from the drain to a chimney, whereby all foul air is removed, the kitchen admirably ventilated, and cholera sent up chimney like a witch on a broomstick. But who, unless interested in science, ever acts on such a suggestion? So in respect to the whole vital subject of ventilation, and the entire sanitary condition of the house. It is a singular fact that farmers' families, which should be the healthiest, are as subject to sickness as any other households, especially to fevers,—perhaps from the inattention which seemingly robust health gives to sleeping-room ventilation, and the fact that there is much decaying or drying vegetable matter in the cellar and around the barn.

Thirdly. We are thus led to see that this study is imperative on woman, because she is the physician of the family. To illustrate: there is that boy or girl reading at a distance of ten feet from the lamp. His unscientific mother does not notice it; or perhaps she learned at school the law that light decreases as the square of the distance, with no idea that it had any household application. The rightly educated mother at once sees that, at ten feet distance, the light is twenty-five times less than at two feet. Again, in all probability, there is a child facing the light, the pupil of the eye contracted, and the page of the book in shadow. If health depends at times more on the doctor's ministrations, these are more rare. Woman is really the family physician and the whole Board of Health.

Fourthly. Science would facilitate home work and improve the great art of living. Mrs. Stowe rightly asserts that housekeeping should be elevated to the rank of a profession, and be thought worthy of a course of study. She says: "Women study treatises on political economy in schools; and why should not the study of domestic economy form a part of every school course? If it be thought worth while to provide at great expense apparatus for teaching the revolutions of Saturn's moons and the precession of the equinoxes, why should there not be some to teach what it may greatly concern a woman's earthly happiness to know?"

I hope a Professorship of Domestic Economy will be established in the Massachusetts Agricultural College, for the benefit of the many young women who will ere long claim the advantages of that institution, especially the excellent facilities it offers for the study of chemistry, botany and horticulture. Woman has a right to all educational advantages. On the opening day of the noble Agricultural College of Iowa, a large number of ladies were received among the pupils, and no harm has come of it yet. At the West the co-education of the sexes is no longer an experiment. It is fully proved that it promotes a higher tone of study, of mind, manners and morals, than can be found in our old Protestant monasteries and nunneries. Even old England is getting ahead of New England on this subject. It is all very well for us to be slow and sure, but there is no merit in being as slow as the farmer's horse, which had but one fault,—he was "as slow as cold molasses." Our extreme conservatism, however, may be "not a fault but a misfortune," as in the instance of the consumptive horse that was sold as being without a fault.

Certainly, this study will smooth and bless home life. The scientific housekeeper, for reasons she understands, never, for example, washes cotton or linen in hard water, and she can soften water in a variety of ways, if it be hard; she knows how to detect an excess of silicate of soda in the soap, invented after the war had cut off the supply of South Carolina rosin; she never uses rosin soap for woollen; and she can remove all kinds of spots and stains by using the proper class of solvents. Having made her own indelible ink by dropping a piece of silver into a pennyworth of nitric acid, she removes an accidental drop of it from the tablecloth by using a pinch of moistened common salt, that turns the blot to chloride of silver, which can be dissolved with a drop of ammonia. And she never forgets how to do anything or loses a good hint, because she knows the whole simple philosophy of the matter.

And, with such intelligent housekeepers, there would be progress in the art. The fact that your grandmother's doughnuts have never been excelled, proves that housekeeping has made no advance, and hence that science needs to be applied to this in education. Woman is intuitive and therefore would be inventive, were she not left to believe that her work is mere routine drudgery. It is reported that a poor apple-woman in New York invented the paper strings now in common use. The rightly educated woman could at least appreciate and apply all good inventions, and reject the many foolish ones hawked about the country. She would have the mechanical knowledge, too, necessary to keep all household machinery in good order, and so be saved from much vexation.

But some one may say, the difficulty is not so much in needed facilities, as in the slavish nature of the work. This leads me to remark, in the next place, that home science would dignify and inspirit, yes, glorify the drudgery of household toil. Chemistry is kitchen work, dish-work, and dish-washing; yet, not for a moment does the chemist feel degraded or weary. The science transmutes the glass to crystal, the iron to gold, the labor to lofty play. The Emperor of Brazil has his laboratory, where he does this chemical work. And what is all kitchen work but chemistry?

A thing of science, like "a thing of beauty, is a joy forever." A drop of water falls on the hot stove. The good housewife, who is an unthinking drudge, does not notice it, or she only says to herself—"La, sakes! how hot that stove is!" The drop, still round, rolls along the stove and dances till it rolls off. Why did it not change to vapor at once? Because the heat converts its outer particles into a cushion of steam, on which it rests. How is that? Each outside particle of water, changed to steam, flies off with such energy that its recoil holds up the drop. Let it roll to a part of the stove less hot; it sinks down flat and is wholly transformed to vapor. This drop suggests a thousand wonders, and the entire amazing theory of heat, as recently demonstrated by men of science.

Hence, further, if our housewife, in her kitchen laboratory, has a devout spirit, she is exalted by continual suggestions of the Great Divine Cause. As quaint George Herbert wrote, two hundred years ago:—

"A servant with this clause,
Makes drudgery divine:
Who sweeps a room, as for Thy laws,
Makes that, and th' action fine."

And the new discoveries of science would ever freshen the eternal freshness of scientific work. In beets, in tea and coffee, the comparatively new metal, Rubidium, has been detected by that marvellous spectrum analysis which shows us the metals that exist in the sun, and in the far-off fixed stars—even detects nitrogen in a comet and sodium in a shooting star. So, also, the recent doctrine of dialysis, while applied to so humble a use as the separation of meat-brine into pure salt and excellent soup, at the same time explains one of the profound mysteries of animal and vegetable life.

Woman's happiness, moreover, would be negative as well as positive. Ignorance is full of fear and disgust towards innocent things. That odorous fermenting pailful of waste from the table is really an interesting mixture of many acids and bases, entering into new combinations. That dreadful spider is not poisonous, and has eight jewels of eyes in his head. That medicine is no more a metallic poison than the oxydized metal, lime, which makes your bones. "Do not be afraid of dirt, young gentlemen," said a distinguished medical professor; "dirt makes bread, and bread makes the lips you kiss."

Our lady bachelor of science would likewise have the pleasure of exact economy in the use of materials. Woman, naturally, is impulsive. If she thinks the biscuit require more soda, she throws in enough to neutralize a gallon of the acid in the milk,—"There, I'll see if I can't make the biscuit right this time!" Whether it be impulsiveness or ignorance, it would be rectified by knowing the exact proportions in which all substances combine. At least, there would be knowledge enough to use a bit of cheap test-paper, as the chemist does, to know exactly when an acid is neutralized.

And the exactness of nature teaches habits of neatness, carefulness, attention. Scientific work is the most nice and precise of any in the world, and inevitably affects all habits.

But this is not all. There is an element of moral illustration, often humorous, that would be enjoyed by the scientific housekeeper. There is a tragedy in a loaf of bread. Gluten is a gummy, weak-minded individual, having too much nitrogen in his composition, and exists in flour, hence in dough. He is easily demoralized by the least association with that restless son of a brewer, Yeast, or with that destructive rogue, Oxygen. And when Gluten loses what little stability he has, his example at once affects the sweet children of the Sugar family, also present in the dough, until they become as ungovernable as alcohol and carbonic acid,—in fact are changed into these. But Gluten maliciously holds them as they struggle to get away; and at last Heat comes on with a vengeance, and striking Gluten stiff for his mischief, drives *them* away from their bread, and so they go to bed supperless, because they have been in bad company. That is the way bread is raised; and the scientific housewife would be able to tell her children the edifying story.

The young lady who wastes her time in reading novels might find a salutary romance in a soda-biscuit. Soda is a giddy girl who accepts the society of that respectable youth, Carbonic Acid, he being chiefly engaged in the limestone business, though also a worthy agriculturist, raising plants. In a biscuit picnic, she—Soda—first meets Tartaric Acid, who is a dissipated person, known to be found around wine-casks. She forsakes Carbonic for Tartaric, and finds that she has caught a Tartar. Surely, our lady-chemist would be better occupied in prying into the doings of Soda, Gluten and the rest, than in gossiping about her neighbors' affairs.

This word "gossip" suggests another reason for the pursuit of Home Science. It would lift the whole matter of housekeeping above the low level of idle talk about housekeeping itself. What everlasting table-talk on this subject do we hear, of a sort no more elevated than that which geese indulge in over a dinner of pollywogs. Perhaps a quarter of an hour is spent in discussing the price of sugar, and telling where this or that person buys sugar, whether at White & Co.'s or Brown & Co.'s, and who does like sugar in tea and who doesn't, and whose aunt does and whose doesn't. Now, what an infinite fund of thought and interest there is in sugar, its sources, manufacture, chemical varieties, physiological effects—the last point suggesting a series of experiments recently made on the muscle-forming value of non-nitrogenous food, disproving the doctrine of our text-books. What entertainment in the thought that sugar and starch are simply the forms in which we, human locomotives, take our coal and water.

However, there is one weighty consideration that alone should recommend the study of science in this connection, namely, health. Health is physical happiness. With strength enough, there is no such thing as hard work. Our philosophic housekeepers would secure greater vigor in a thousand ways—dress, diet, ventilation, etc. Take a single illustration—moisture in the air. They would be able at once to determine the amount, and thus would know whether an evaporating pan is advisable in the stove or furnace,—would not be left to any writer's unqualified recommendation or condemnation of this expedient. In the kitchen, they could have a large hood over the cook-stove to carry off the excessive vapors and fumes which saturate the air, cloy the appetite, and prevent the healthy invisible perspiration, which may be even fatally arrested while one seems to be in profuse perspiration.

Why is it that our women are often overtasked and broken-down in health? Is it not in part through ignorance, such as that now indicated, and, above all, through lack of real interest and spirit in work—the degrading and dispiriting nature of all labor that is pursued mechanically, with no lively participation of intellect and soul, especially if it be confined in-door toil, and with no end in view but the finishing of a day's task? There must be fresh air, and either an intellectual or a money interest, to keep up one's vigor and spirit. All this woman lacks, for the most part, as things are. She has nothing but affectional motives, and these are often chilled and disappointed.

In the good time coming, we shall have a thousand professors of home science, and hundreds of thousands of lady-graduates from our scientific schools. And it shall be said of the virtuous woman, "she openeth her mouth with wisdom." She maketh no fire in summer, but boileth her water in ten minutes by agitation in a vessel turned by a wind-mill, after the manner of Prof. Tyndall, in his hand experiment. She buyeth condensed extract of meat and milk, and never seeth steak or milk-pan. She sendeth her linen to the steam wash house. She scoureth her woodwork with her own patent revolving spring-brush. She useth enamelled paper plates and cups, like paper collars, and throweth them away after every meal. She analyzeth sugar-candy, and findeth deadly coloring matters, as red oxide of lead and yellow sulphide of arsenic; and she bringeth the confectioner before the lady-justice of the peace. She discardeth all but loose dress, and sweepeth not the streets. Her bonnet is visible and protecteth from the sun. She inventeth a steam-cook and an electric chambermaid, like unto a steam-man that draweth a chariot.

AMERICAN AND EUROPEAN HOMES.

From an Address before the Franklin Agricultural Society.

BY J. F. MOORS.

One of the most obvious instances of the superiority of the Old World over us, is in the character of the common roads. The poorest road I saw in Europe is vastly better than the best road there is in this region. Macadamized roads are well-nigh universal. The road-bed is dug out two or three feet, according to the nature of the soil, and filled with loose stones that will allow complete drainage; over these a heavy layer of small stones, not any so large as a hen's egg, broken up for this purpose, is spread. These soon form into a compact mass of stone under the pressure of the wheels, thus forming a natural mosaic, impervious to the rain, uninfluenced by frost, as smooth as the floor, as hard as iron. It is never muddy, seldom dusty. I think one horse would do the labor on a common road in England or France or Germany or Italy, which it would require two horses to do in our country. The bridges of hammered stone, are marvels of art and of strength. Such roads, such bridges, are out of our reach as yet. We have not the wealth to build them. They are the product of hundreds of years of labor. It is not two hundred years since this was a wilderness.

In comparison between the Old World and this, we must always take into account the exceeding cheapness and abundance of labor abroad. Labor is the one thing that does not have to be economized. Human labor, I mean. In every country in Europe, an immense amount of labor is done by men and women, that in this country would be done by machinery, or by oxen and horses. The farther east and south you go, where the climate is warm, and as a consequence the population more dense, this use of human muscle is more apparent. In Fgypt, for instance, I watched on one occasion a swarm of human beings, there could not have been less than two or three thousand, repairing a piece of road which had been washed out by an inundation of the Nile. They were men, women and children, half or wholly naked. All the machinery they had were some rude shovels and baskets. With the shovel the basket was filled with earth, then carried upon the head a fourth of a mile or so, and dumped into the hole it was designed to fill. These people, employed by the government, received five or six cents, the men ten cents a day, for their enforced labor, continued unremittingly under the eyes of severe taskmasters day by day, until the work was completed. There was no Sabbath-day rest, there was not even the welcome prospects of a rainy day to suspend their dreary round of toil and suffering, for.in that country it never rains. You may calculate with unerring certainty upon 365 days in the year of unclouded sunshine.

In England, a common laborer upon the farm would receive about twenty-five dollars a year and his board In Germany it would be a little less. Women in Germany receive about sixteen dollars a year and board. There is very little chance for labor-saving machines where labor is so cheap. Except in England, agricultural tools were very clumsy and rude, such as no New England farmer would use for a single day. They are the same patterns that have been used for centuries.

Farming throughout Europe is gardening rather than farming. The fields are small, but there is the utmost economy of room. Every spot is occupied, and shows the utmost care. In Italy a great deal of wheat is raised. But it is never sown broadcast. It is always carefully planted in drills, and carefully hoed and weeded. The absence of weeds and all foul stuff in the midst of growing crops, cannot fail to attract the attention of the traveller accustomed to our more slovenly husbandry. In Germany the eye is never weary with looking upon the neat and beautiful fields, variegated with growing crops of all kinds. The fields are small, but not a fence of any kind is to be seen, not even by the side of the road. They often reminded me of the Deerfield meadow. Of course no cattle were allowed to roam unattended. They are usually stall-fed.

In England, on the other hand, fences abound. The fields are small, and are separated by fences, but not of unsightly posts and rails. They are almost invariably of living hedge, usually of hawthorn, neatly trimmed, and a very attractive feature of the landscape.

In our country, as the forests diminish, and timber becomes more scarce and costly, we shall learn to dispense very largely with fences which now so often disfigure our farms. The support of fences is an immense tax upon the owners of land, a tax from which they will free themselves in time. As soon as it is known in the community that cattle cannot roam at will, that our domestic fowls must be restrained within the precincts of their owners, the necessity of one-half the existing fences will be done away.

One must study farm life abroad chiefly to observe its contrasts with the same life here. The circumstances are so entirely different that but few of the methods abroad would answer with us. For instance, there is no country one visits more interesting than Egypt. In no country is there such fertility and such abundant crops as on the banks of the Nile. "Rich as Nile mud," is a comparison I feel the force of as I did not until I saw the Nile. But we could not introduce Egyptian agriculture into New England. Let me speak of it very briefly. No rain falls in Cairo, where I spent two weeks; and yet the country about there is the most fertile I ever saw. Its fertility is wholly due to artificial irrigation. The Nile is everything to the country. It is not strange it was esteemed a god and worshipped by the Egyptians. Fed by melting snows and rains hundreds of miles to the south, among the mountains, it flows to the sea without a tributary. About the last of June its waters begin to rise, and continue to increase till the middle of September, when it is at its flood.

At Cairo, its usual and desirable rise is twenty-two feet. It varies from nineteen to twenty-four feet. If it does not rise over nineteen feet, it is not sufficient to water the land; the crops fail, and famine ensues. If it rises over twenty-four feet, it breaks down dikes, floods villages and towns, and makes a terrible destruction. Both extremes have occurred several times within a century.

In an average season it flows over the whole valley eight or ten miles wide on both sides of the river. The water is charged with mud, which it deposits everywhere to the average depth of a twentieth part of an inch every year, sufficient to enrich the soil abundantly. The water is let into canals prepared for that purpose, and when the canal is full at high water, the opening into the river is closed, and the water is retained for future use. Every depression into which the water settles is surrounded, with mud walls, making a pond for the precious fluid when the deluge runs off or is soaked into the ground. These immense reservoirs of water are made to last through all the season. The great business of the Egyptian farmer is to coax the water of the river on to his land, and to make a pond of water near at hand for future use. As soon as the water is sufficiently subsided and dried, the land is ploughed with a rude plough of the same pattern as that used in the time of Moses. The seed is sown, and then the chief labor is to keep the field sufficiently irrigated. The skill, patience and labor displayed in this rude industry are most interesting to behold. The result is the most abundant harvests—three in succession, in a year, from the same spot of land, of wheat, beans, barley and cotton. Where the land is overflowed and watered, it is the most fertile you can imagine; but a rod beyond where the water reaches, the desert begins; from a fertile, fruitful garden, you step at once to the dry, barren sand, as destitute of vegetation as the floor of this platform.

The water is raised in buckets, by men, with the rudest machinery, and poured upon the upper level. Thousands are thus employed. No manuring is needed, no ploughing and hoeing of crops. To plant, to water, to reap, is the endless round of labor.

One is often asked about the dwelling-houses of the Old World as compared with the dwellings here. Of course they are very different, and a comparison would be altogether in favor of our own country, as far as comfort and convenience are concerned. I do not speak of the elegant and costly palaces of the nobility; I speak of the dwellings of the great mass of the people. They are built almost invariably of stone or brick, chiefly of stone, in country as well as city. A wooden house one never sees, except in Switzerland. The houses are old, very old, for the most part; they look old, and weather-stained and dingy. As contrasted with houses with us, the windows are very few and very small. The floors and stair-cases are chiefly of stone, the roofs are of slate, or earthen tiles, or straw thatch. Very little wood enters into the construction. Built three or five, or even ten centuries ago, it is almost impossible to introduce modern improvements. The old house, and the old clumsy furniture which belonged to the fathers and grandfathers, are transmitted unchanged to the children. Some writer, I believe it was Thoreau, says in substance, that it would be a blessing to the world if all houses could be torn down once in fifty years, in order that in rebuilding men might build better than their fathers. I have often felt what a curse it was, in almost every country in which I have travelled, that the present generations should be saddled with those old antiquated absurdities in the way of houses, too strong to be remodelled, and too inconvenient to be really enjoyed.

In the old countries, houses are concentrated into villages and towns much more than with us. This was required for safety and protection hundreds of years ago, and so fixed and stable are all customs that it continues so to this day. One of the results is, that men and women often live at a great distance from the land they cultivate. The houses are huddled together, and are gloomy and monotonous. Very beautiful and sacred is the tie that binds one to the house in which he was born, and in which his ancestors for hundreds of years have lived ; but those associations are often bought at great cost. We have nothing of that stability with us. We love the *new* more than we reverence the *old*. We are constantly seeking how we can tear down and alter and build anew, for the sake of securing greater convenience. So far as my observation goes, the people of no nation are on the whole better housed than we are. One of the special charms of our landscape is the neat and comfortable farmhouses that dot our hillsides and nestle in the valleys, and yet we have by no means reached the summit of excellence in our domestic architecture. I speak now not as regards taste, not as to what is well pleasing to a cultivated eye. I think we have a great deal to learn in this direction. But I speak of the defects of our domestic architecture as affecting the health of our people. We are often told that the New England farmer and mechanic, if he secures nothing else, has it in his power to secure health and a home.

And now I have reached at last, beyond the middle of my address, the subject I want to talk with you about—" our homes as affecting our health." Our homes, I say; I mean to include our whole manner of living. I think there are but few houses in which any of us live, here in Franklin County, which do not in some way conduce to avoidable sickness and disease. It may seem extravagant to say so. I believe it to be the fact with the houses occupied by all classes of people. Farmers, mechanics, merchants, professional men, all alike live in unhealthy houses. Every day that I ride about this county, I see houses that are situated in unhealthy localities, on the north side of hills, in damp valleys near swamps, and meadows where fatal miasma is bred. Riding in the evening, you often pass from a warm, dry stratum of air into one that is cold and damp and chilly. A house situated in the latter cannot be as healthy as if situated in the drier atmosphere.

Very many houses are made unhealthy by a superabundance of shade trees. I could point you out houses within five miles of this spot upon which the sun rarely shines, in which the air is like that of a cellar. That house is not a healthy one to live in. It is very pretty and poetical to have a house embowered with graceful elms and symmetrical maples; very comfortable is such a house in the hot, sweltering days of such a summer as this just past. But it is not healthy, that is all. The people do not all die off at once, it is true, but they have not that measure of vigor and strength they ought to have, and would have if they did not live so much in the shade. It has become the fashion to set out shade trees about the house—a good fashion if not carried to excess. Trees are often too numerous, and set too near the house. They absorb the air and sunlight, both of which are indispensable to health.

I must speak of another source of ill-health in our houses. It is the condition of the drains and water-closets. There are multitudes of cases where these things are so bad as to be a disgrace to the owners and occupants. In front of the house all will be very clean and tidy and dry and wholesome, and bear all the marks of taste and refinement, but go round to the back door, and all is changed. There is filth and disorder; amid decaying vegetable matter, chips, blocks of wood and timber, and rotting weeds, there will be a pool in which is collected the water from the sink, reeking with poisonous exhalations, and filling the very room in which the family lives with deadly odors.

I knew a farmer once who suffered fearfully every summer from musquitoes, which deprived him of his needed rest and made his bed a place of torture instead of repose. Musquito bars were unknown, so he used to burn old boots or anything that would make a smudge, to keep off the tormenting insects. He never suspected that he was supporting a grand musquito factory just under his nose, in the drain from his sink. The good Lord sent these musquitoes, that the ignorant farmer was tempted to curse, on purpose to devour the decaying vegetable and animal life from that drain, which would have been poison to that family with every breath they drew. I know of a family in which there has always been a good deal of sickness, fevers and the like. I confidently believe that one cause was the fact that their pig-pen was right close to their kitchen windows, and the chips from their winter stock of wood were allowed to rot by the kitchen door. The family simply invited disease to enter their house. They set traps to catch him. Not half attention enough is paid to cleanliness and health in the matter of house drains. When we find more occasion for economy than we do, as yet, we shall utilize all the refuse from our houses. Till that time comes we cannot be too careful to carry all such so deeply into the ground that no noxious gas from them can pollute the air we breathe. God in his goodness has provided an abundance of fresh and pure air, and made the use of it the condition of life and health. It is a sin for us to abuse his gift as we so often do. It is not wise nor manly to neglect the conditions of health, to invite disease and death to enter our homes, and when he comes charge it all upon Divine Providence. To a considerable extent we have the conditions of health in our keeping.

Entering the house, the cellar is the first place that claims our attention. The health of the family is materially affected by the condition of the cellar. A cellar that is wet or even damp is unhealthy, a breeder of sickness and disease. How many such cellars there are in which water stands for a considerable part of the year, or into which it oozes through cracks in the wall whenever there is a rain. Health demands as one of the first conditions in building a house, that it should stand over a dry, ventilated cellar. The difficulty is not confined to a wet cellar. Very many houses are rendered unhealthy by decaying vegetable matter in the cellar. Old tubs and barrels, and boxes and boards are allowed to accumulate there and moulder away to dust, furnishing a harbor for countless loathsome insects, and worse still, the winter's stock of vegetables, not quite exhausted, is allowed to remain and rot and send up their invisible, noxious gases into the rooms in which the family live, mixing an element of death into the very air they breathe. When our good women boast of their neatness and their thorough house-keeping, I want to see not only their parlor and kitchen, but I want to see how it is away out in the back kitchen and shed, and especially I want to see how it is in their cellar. A neat, even elegant parlor, will not atone for a dirty, disease-breeding out-house and cellar. I fear there are many such.

It has become almost universal to have outside blinds upon our windows; a good thing to have if used judiciously, to shut out a hot summer sun, and mitigate the noonday heat, but used as they so commonly are, to exclude the sun altogether, to keep the carpet and curtains from fading, they become a nuisance. We need the sun in our houses. We need to live within reach of its beams. It is the source of life and strength to the human frame as well as to the vegetable world.

A very fruitful source of sickness, disease and death in our community is to be found in our defective methods of warming our houses. It is done now almost wholly by close, iron stoves in our rooms or by a furnace in the cellar. It is very easy to warm a house in this way. It is an economy of fuel. But one result is that our houses are almost universally heated to an unhealthy degree,—to a degree that but few are aware of.

The healthy and comfortable temperature of a room in which one is to be active, is sixty degrees Fahrenheit. If one is to sit down there and be quiet, he needs either a little more heat or a little more clothing. The latter would be the best. If more heat is required the thermometer should not be raised above sixty-five degrees, seventy degrees is the extreme height that should be allowed. The majority of the people in this county will live this winter in rooms heated to seventy-five and eighty degrees, often higher; and the common form of salutation will be, "How do you do?" "Pretty well, except a cold." "How are your family?" "All well, except colds." The close, iron stove destroys the vitality of the air. How sleepy and dull we all are when the fire is first kindled in the autumn. There is very little ventilation in our rooms thus heated. The air is made impure and unwholesome by repeated use. There is no question about it. There has been a decided lowering of the public health since tight stoves came in use. There is no denying the fact that the average physical vigor of the people abroad, especially the women, is greater than with us. The difference of climate will not account for it. It is owing largely to two causes. The people abroad live a great deal more in the open air than we do. They walk more. I saw English ladies in Switzerland that considered it a trifle to walk twenty-five miles a day.

The other cause of better health abroad is, that when in-doors they do not live in hot and close rooms as we do. For seven months of the year we must have some artificial heat. We have fallen into the habit of heating to excess, and an immense amount of sickness and disease results from it. But what remedy can one propose ? The regulating the heat of the room by a thermometer would, at least, admonish us when our rooms were too hot. Putting suitable ventilators into our chimneys would lessen the evil in a measure. The use of open stoves would lessen it still more. But the expense ; who can afford an open fire, with wood at ten dollars a cord ? Very many can afford it better than pay a doctor's bill or see consumption wasting away the lives of their family. At that price we can afford to learn economy in the use of fuel. As a people we are exceedingly wasteful. There is such an abundance of everything around us, that we are accustomed to use the best and throw the rest away. It is a common remark, and it is nearly true, that a French or Italian family lives on what an American family would throw away. It is especially true of fuel. We are excessively wasteful of it. Many a farmer will cut down beautiful trees and convert them into fuel for his winter's fire, when there is useless rubbish enough piled up, or rather scattered about his house and barn and fences, to keep his family warm all winter, and the removal of which would turn his premises from slovenliness to neatness.

I learned something last winter about economy in fuel. I was keeping house in Rome. I bought my wood by the pound, and I found it made a great deal of difference in the amount used whether I bought by the cord or the pound. The thought of buying a cord of wood was never entertained by a Roman. I don't suppose the Pope himself, if he had wanted to warm all the four thousand rooms of his imperial residence, would have bought a *cord* of wood. It would have been extravagant. All the cuttings of the grape-vines were saved, tied up into bundles and sold. Sawdust and tan-bark were pressed into delicate little cakes and sold for fuel, and very excellent fuel they were. Nothing of vegetable matter was allowed to be wasted.

I saw the necessity which is felt for economy of fuel carried to a sad extreme. In the city of Alexandria I went to see Pompey's pillar, as it is called, the most beautiful shaft I ever saw. Near by I saw a squad of women at work. I crossed over to see what they were doing. I saw that some were bringing from the city in baskets on their heads the manure of the streets which they had carefully saved. They dumped it down in a pile, and several women were busy working it up in their hands into little round cakes, a foot in diameter and an inch thick, and spreading them out to dry. That was the fuel of a great part of the population of the city. May it be long before we find the necessity for such economy.

The table is set with a lavish profusion in our country which is witnessed nowhere else. We eat more meat and more rich pastry than other nations.

They make more account of fresh fruit than we do, and eat it with the first meal of the day, which is the time to eat it. I confess to a preference for our cooking over the made-up dishes of France and Germany, where you can hardly tell whether it is beef or horse on which you are making your dinner. But when our housekeepers learn to dispense with hot bread, with saleratus, with fried meats, with green tea, which is made only for the American market, with mince pies and that frightful compound called wedding cake, and adopt plainer and simpler fare, there will be far less dyspeptics and far less weak and disordered nerves.

Upon one topic more intimately connected with my subject, I want to add a few words. I refer to the employment of women in out-door pursuits. Women are engaged in all kinds of out-door labors abroad. In England they work in the fields chiefly at harvest time. In France they take care of the vines. In Germany they join with men in most of the labor that is done. And everywhere they find time to cultivate the most beautiful gardens filled with the choicest varieties of fruit and flowers. I certainly do not desire to see the women of our own land, the young women, become such beasts of burden as are their sisters of the Old World. There is no necessity for it. But I should rejoice to see the women, the young women, taking more interest in and sharing more abundantly in out of door pursuits. It is not necessary for the farmer's wife or daughter to hold the plough or dig the ditches; but there is a great deal of work that women can do and ought to do, and which would make them happier and healthier to do. Happier, for it would give an abundant and inspiring occupation. Healthier, for it would drive them out of doors, out of the hot, poisonous air of the house, out into the free, fresh, health-quickening, out-of-door air. I speak not of farmers' wives and daughters alone. I speak of women of all classes, the richest and the poorest. They can and ought to cultivate all the smaller fruits, like strawberries and raspberries and the like, a healthy and refining food which ought to be abundant on every table, till it expels the salt pork and other like abominations,—food which would be sweeter to all tastes if raised by the fair hands of wives and daughters.

The same is true of the culture of the grape. It should not be a luxury on a few tables, but cheap and abundant enough to be on all tables, and watched over, and studied, and understood, and cultivated by the women. And so of the vegetable garden. The men ought to be driven out of it as valiantly as the chickens or the pigs. Do you say that our women do work in the garden? Yes; I know how bravely they start out in the spring, trowel in hand, and after the ground has been prepared for them, they manage to plant a few China asters, and marigolds, and dahlias, and their work is all over. Our women love flowers, but they love them as results, as bouquets upon their tables. It does not compare with the love they would have for them if they had watched their growth from the seed, and had cultivated a life-long and intimate acquaintance with them. They would thus find the exquisite bloom of health on their own cheeks of incomparably more worth than that of the most delicate flower.

I confess to a good deal of disgust with the standard of education which is set up for our young women in this country. A little French and less Latin, a good deal of drumming the keys of the piano with painful results, a little fancy needle-work. Well, it is dangerous ground I am treading upon. I will not say how much enters into the average education of our girls. The result is to make very interesting but very delicate specimens—exquisite dolls, rather than noble, womanly women. About the most disagreeable feature of our social life now, is the result of the fact that domestic service has been so far discarded by our women, our young women, till it has become unfashionable. It leaves all our house-keeping, all the peace and comfort of our families, in fact, at the mercy of ignorant labor of foreign origin. All our women are praying that they may lay hold of a Chinese man to keep their house.

There are but two ways out of this trouble about domestic service. One is a radical change in the ideas of our people as to what constitutes a proper education for our young women. We must learn, as we are learning from painful experience, that merely intellectual training may be, and often is, carried to a fatal excess; and that merely fashionable accomplishment is an aim wholly unworthy a true-minded American woman.

Let our young women be sent to school a great deal less, and learn a great deal less about fashions and novels, and be sent into the kitchen and garden a great deal more, and they would be happier and healthier, and we should be able to declare our independence of Ireland, which we now so humbly serve.

The other remedy I had in mind is to secure in our homes a simpler style of living, one that will not impose such burdens upon the housekeepers. It could be done. Let the baking of the family be done at the bakery, as it invariably is in the old countries. Let the washing and ironing be done at the laundry. Dispense with the unhealthy preserves and pastries that load our tables and give us dyspepsia, and our household burdens would be lightened.

The New England homes, when compared with homes elsewhere, stand the test well. I know how much refinement and taste and intelligence and virtue is found in them. I know not where their equal is found. But there is yet much for us to learn. We have not that measure of health and strength we might have. There is among us an immense amount of sickness and suffering and premature death which is to be attributed to our ignorance or our neglect of the Divine laws. The standard of health is not so great among our native-born citizens as it once was. Some of the reasons I have hinted at. It is for us all to learn, whether we cultivate the soil or practise the mechanic arts, that the great end and aim of life is the culture of noble, true, God-serving men and women. In our homes let there be health and purity and intelligence and virtue, and our community will be peaceful, happy and prosperous. Give us such homes. Earth furnishes no worthier employment. The heart can find no happier duty. The Heavenly Father can smile upon no more acceptable offering.

MUTUAL DEPENDENCE OF OUR PRODUCING INDUSTRIES.

From an Address before the Berkshire Agricultural Society.

BY LEVI STOCKBRIDGE.

Now, can we provide for this demand, or for any, and what, portion of it? We should remember what the great producing West will be sure to supply, and avoid competing with their special crops and mode of culture. The system of the competing culture is of the utmost importance, for no man who is so managing his land that it is constantly increasing in fertility, can compete with him whose plan and practice is to take up rich fields, produce crops at the expense of the soil, and to sell out and remove when its fertility shall measurably fail. The West, with the fact looking them full in the face that their crops are annually decreasing, are selling grain, and in all probability are bound to do so, so long as there remain so many untilled acres to be despoiled. Pork and beef also, the feeding at home of which is a great improvement in their mode of culture, will be articles which they will forward in large quantities. We had better do nothing to compete with or stop this inflowing stream of Western products of prime necessity, but receive it, especially the grain, and make it aid in the improvement of our fields, while we give our attention to products less exhausting and more profitable. Not that a Massachusetts farmer cannot make as much money on, or raise a bushel of corn and wheat, and put it into the market as cheap as the farmer of Illinois or Iowa, if he will pursue the same mode of cultivation and live in the same manner, but that he can, in consequence of his home market, and their follies, produce crops with which they cannot compete, and make more money. Grain, beef, pork, while they are articles of prime necessity, go but a little way in supplying the wants of a family in a New England village, and for which they are able and willing to pay. Choice vegetables of every variety, early and late, fruits, large and small, the old standard kinds and the new varieties, roots of every kind, forage, milk, butter, cheese, young meat, veal, lamb, poultry, these are all in great and increasing demand; they are preferred, and sought for the home supply, and no attempt is or will be made to obtain them from abroad, so long as they can be procured here.

The condition of our soil to-day is such that no efforts of ours would avail to furnish all the food of our people, even if it was desirable. It is undoubtedly our wisest course to thoroughly understand the wants, present and prospective, of our consuming population; the capabilities of our soil, the crops we can grow best and preserve its fertility, the special advantages and disadvantages of our respective locations for supplying some one or more of the wants of the market of our immediate neighborhood. It is impossible to say what should be the leading crop or crops of each individual farmer. This matter each must decide for himself according to surrounding circumstances. As a rule it is well, but not imperative, for each and every farmer to supply from his soil all the food of his family which it is capable of producing, as this can be done as an adjunct to his main business of producing other crops for sale, and by the rotation necessary to his process of culture. In this way it may be well for him at times to grow the wheat for family consumption, for there are few farms in the State on which, in this sense, it cannot be profitably grown. If the first attempt fail, indicating a want in the soil or uncongenial climate, early sowing and an application of the mineral constituents of the wheat plant, which can be cheaply made, will make success a certainty.

The farmer, before adopting the line of husbandry to be pursued, and the crops to be sold from the farm, should know precisely what effect that culture and the deportation of those crops will have upon his farm, that he may guard against its deterioration. If the wants of his market induce him to engage in vegetable culture, and he sells potatoes, cabbages, onions, and the varied products of the market garden, he should know that he is rapidly exporting the potash of his soil, and in no small amount the lime and magnesia. And if he would be able to keep his land in condition to continually produce such crops, he must continually supply the loss. If milk is taken as his market product, he should be aware that in this article he is sending away a concentration of all the finest, best elements of the soil's fertility, both mineral and nitrogenous, and the land won't long bear the drain, without losing its power to produce those fine, succulent grasses necessary to produce milk. If he make cheese, it is but little better, and the exported material must be supplied with some sort of fertilizer. If butter is his chosen product for sale, and his skimmed milk is consumed at home, he has little care to take about depleting his soil, but must watch with closest scrutiny the process of manufacturing his product, feed judiciously and kindly care for his stock, while he grows as rich as the golden balls he sends to market. For this crop takes almost nothing of the mineral elements of fertility from the soil, but is composed chiefly of carbon, which the acid of the air will supply to the herbage of his fields without thought or care of him.

If, owing to circumstances, he chooses to enter the lists and compete in the beef market with the Western farmer, let him purchase of that farmer or somebody else mature animals, not to grow, but simply to fatten upon his pastures or in his stalls, and his profit will come quickly and in satisfactory amount, and he takes from his land little else but carbon in the fat he puts on the carcass purchased. If his taste and his farm incline him to try his skill and intelligence in growing stock, let him select some one of our thoroughbred breeds, and rear for a live market (and here, at the present time, is one of our most inviting fields of culture). But he is actually making up into animal form, into bones, muscles and tissues, the choicest elements of the plant-food of the soil, to be carried away, and which he must return in grain purchased to facilitate their growth, or in lime, potash, phosphoric acid and nitrogenous materials, or the land will ere long cease to yield its increase.

If the farmer has a love for it, he will find in fruit culture a large field in which to exercise his skill; for in some form it is fast becoming a staple article of consumption, and ordinarily the demand is far beyond the supply. Besides the care of the plants and the harvesting and marketing of the fruit, no great attention is needed. A crop of fruit depletes the soil but little compared with our cultivated crops, and needs only a friable soil, with occasional applications of mineral manures in solvent form.

But again, if the Massachusetts farmer would make the most of his advantages, he must enter fully into the spirit of this wide-awake, competitive, driving age. No man now, who shuts his eyes and moves at a snail's pace to prevent a catastrophe, ought to expect or deserves to win. We are moving by the force of steam, and with telegraphic speed, and with these modern appliances we do it safely. As others do, so must the farmer,—concentrate all his skill, intelligence and energy on one main pursuit, and in this way command success. How successful, think you, would be the manufacturer, who, in one and the same establishment, and with the same set of hands, should attempt to manufacture all the different kinds of cotton and woollen goods, or to produce the different kinds with the same machinery; who should add to his establishment the making of cutlery, locomotives, machinery and every variety of Yankee notions, instead of giving all his care, thought and study to the production and perfection of one article, and the machine of its manufacture; or who should this year fill his establishment with cotton machinery, run it a twelvemonth, then take it out and put in that for the manufacture of woollens; another, engage in iron manufacture, and the next in plate glass? Would he succeed? No; he would, as he deserved, miserably fail in all; he would declare that manufacturing did not pay, and sell out and go into other business, or move West.

So, too, in agriculture; the farmer who attempts to cultivate for market all the crops our soil and climate will produce, will signally fail of that high success to which he might attain if his attention and study were directed to the perfecting of a single crop. The evil is twofold. First in the cultivation, and next in marketing his produce. Concentration of skill and energy is essential to success, but he scatters himself and his power over a great variety of objects, and his blows are not effective at any of them. He does not have the best appliances for successful cultivation, as he would have if his object was single; he cannot so divide and train his labor as to make it skilful, and the proper cultivation and care of one crop is continually interfering with another. So in marketing his products; he has so little of a kind to sell, and that not of the best, that he is unable to seek the best market, nor can he create one, for he is not a reliable producer. He is in the hands of the middleman, and of the market, whatever it is; for his products of each sort are so limited in amount that he can have no control of it, or influence, except to depress it and injure others. In this case, also, the cost of marketing is a large share of the gross proceeds, for it takes as much time to sell each of his kinds of produce as it would if he had ten or a hundred times as much to sell.

Now instead of pursuing agricultural business in this way, let the farmer select one or two branches of culture which would follow each other in rotation, for which he has a taste, the pursuit of which surrounding circumstances favor; procure the best appliances and skill known; by thought, care and study discover new and better methods; bend all his power and thoughts to make the best article and the greatest quantity at the cheapest cost, and he will, in a measure, control or make his market, and have no occasion to complain that other pursuits are more remunerative than his.

Finally, if the Massachusetts farmer would make the most of his advantages, he must educate himself for his business, and for the position which the wants of this intelligent age demand. That general intelligence and special education of a high order are essential to the successful pursuit of agriculture, would seem to be an axiom to which all would assent. But the fact is far otherwise. The shadow of a darker age than the one in which we now live yet overspreads and lingers upon us, and often in this matter darkens the understanding and perverts the judgment of well meaning and well educated men. The idea that agriculture is a practical pursuit; that it is one requiring energy and labor, and that therefore well-knit bones, tough, elastic muscles, are about the only requisite; that intelligence and education unfits a man, or disinclines him to engage in a laborious pursuit as this is said to be, is the honest opinion of a great many, and of some, I fear, who do not choose to avow it.

Agriculture is a practical pursuit, requiring hard work and energy, practical knowledge, and practice, to make it a success. But it is no more so than that of the medical profession, no more than of the engineer, no more than the artisan or manufacturer. Practical knowledge is the test of your physician's skill. Will you on that account say that the most thorough discipline and theoretical education is not essential for him; that it will make him simply a theorist, a book physician, and give over this noble profession to born physicians, seventh sons, and quacks, who have had no training for their work? We have lived with our souls darkened, and behind the age, if we have not yet taken in, and made a part of our being, the idea that mind controls matter in everything, everywhere, and shapes it to its will, and that the more thoroughly the mind is trained and disciplined, the more fully it is stored with facts, truths and principles, the more powerful is its possessor in dealing with practical material objects.

It is this education which has made the medical profession what it is; this, which has enabled one laborer in the nineteenth century to perform the work of ten in the sixteenth; this, which has built those solid structures which breast the flow of your great rivers, which has invented your modern machinery, built up your thriving manufacturing towns, your endless lines of railroads, with their marvels of engineering, bridges and tunnels, and it is this which has given practical power and efficacy to the blows of the laborer in every department of improvement. Now, shall we deny to or neglect to provide for agriculture that special training which has been the cause of this wonderful progress in every other department of industry? No; not if we are wise. Yes, if we are otherwise, and would have those who come after us despise us for our short-sightedness.

But there are strong and sufficient reasons why the agriculturist should be the last to be neglected in regard to that which is special and relates to this calling alone. The pursuits of many of our people lead them to deal with dead matter, over which they have nearly supreme control. Give to the cotton or woollen manufacturer a pound of cotton or wool, and he can tell you to an inch how much yarn or cloth it will make. He can tell you to a mill how much it will cost to manufacture it. The reason is, his machinery works with unvarying precision, and he controls all the circumstances of success. Not so the farmer. His occupation, when he possesses the highest intelligence, will have much about it that is uncertain and precarious, for his success depends largely on those elemental and natural laws over which he has little control. How absolutely essential it is, then, that he should be thoroughly versed in all those great underlying principles which relate to the soil, its combinations, its chemical and mechanical changes, the processes by which plant-food is created and carried away, the laws which relate to and govern the life, growth and perfection of the animals and plants of the farm,—be qualified by training and discipline to think out, discover and systematize the great truths of his profession, and thus to wring success out of circumstances which would dishearten the ignorant, as well as a most thorough practical knowledge of all the minutiæ of the pursuit and acquaintance with the principles of business, which will enable him to meet on equal ground all the sharp competitions of this competing age.

When the men who own and superintend the working of the soil of Massachusetts shall be thus disciplined and educated; when they adopt a system of cultivation which inures to its gradual improvement, concentrate their energies and intelligence on the production of such special articles as their location demands, then, and only then, will they reap the benefits that may be derived from the home market of our dense and increasing population, and complaints of agriculture as an occupation cease, and we shall occupy the position, by universal consent, which is ours by virtue of our intrinsic importance to the Commonwealth.

PROFESSIONAL EDUCATION THE PRESENT WANT OF AGRICULTURE.

From an Address before the Housatonic Agricultural Society.

BY WILLIAM S. CLARK.

Among the outward circumstances which contribute to human happiness, doubtless all right-minded individuals would enumerate, as of primary importance, pure air, bright sunshine and pleasant scenery ; wholesome food, delicious fruits and charming flowers ; instructive and entertaining books and delightsome music ; comely and comfortable clothing, tasteful and convenient buildings and furniture ; loving and intelligent friends, and an abundance of healthful, agreeable and remunerative employment ; and these are the natural possessions of the properly educated and truly enterprising husbandman. The country homes of Massachusetts are indeed too often sadly deficient in these elements of comfortable living, but it is not the fault of agriculture as an occupation. These things are freely offered to every farmer who desires to have them, and neither wealth, nor political power, nor extraordinary talent is necessary for their acquisition. The great majority of our race must be in the future, as they have been from the beginning, tillers of the soil, producers of food and of the necessary material for commerce and manufactures ; but they need not be ignorant and devoid of taste.

On the contrary, in the good time coming, the refining, elevating and strengthening influences of high intellectual and æsthetic culture will be considered as desirable in the agricultural profession as they are in medicine, law or theology.

It is, however, an indisputable fact that the farmers, even of Massachusetts, to-day, with a few exceptions, fail almost utterly to appreciate the importance of professional or scientific education for their sons, and feel far less respect than they ought for their business. Washington declared this to be "the most useful, the most healthy and the most noble occupation of man," and followed it, so far as his public duties would allow, with energy and ability. Yet there are multitudes on our farms, who will make far greater sacrifices to send their sons to a classical college, or establish them in some branch of trade or manufacture, than they will to prepare them in the best manner to become influential and prosperous in the profession of their fathers.

A celebrated painter having been asked with what he mixed his colors to render them so perfect, is said to have answered, "brains." The most difficult and most complicated of the arts also requires brains in him who would master and improve it. Accordingly we find agriculture most wisely and properly conducted where nature is not too lavish of her favors, but where the circumstances of soil and climate compel men to the exercise of forethought and diligence. In favorable situations within the topics the support of a family requires an exceedingly small amount of labor and skill. Clothing is almost a superfluity, and food springs from the earth in constant and luxuriant profusion. Thus the plantain, which is the staff of life in some equatorial regions, yields one hundred and thirty-three times as much food to the acre as the wheat plant, and needs scarcely any cultivation or care. It is only necessary to renew the plantation once in twenty years, so that the principal labor consists in picking the fruit, which grows within thirty feet of the ground. The plantain is nutritious and healthful in a great variety of forms, and is eaten both ripe and unripe, cooked and uncooked, and in the dry as well as the fresh state. The cocoa-nut, date and sago palms furnish food, drink and clothing, almost as readily as the plantain does food.

How unlike this is the agriculture of Massachusetts, with her rough and sterile soil and her severe climate, demanding a constant and vigorous struggle with both the burning heat of summer and the icy blasts of winter! With anxious care the farmer must provide, during the few brief months when there are no frosts, for the maintenance and shelter of his family and his domestic animals during half the year when no food of any kind will grow. To do this he must be industrious, intelligent and prudent, and to secure more than a bare subsistence he needs all the aid which the highest science can afford.

Notwithstanding the difficulties which beset the farmer in the cooler regions now inhabited by the most civilized nations of the world, the total amount and value of agricultural produce are constantly increasing, and in Great Britain, and doubtless in Massachusetts, this increased product is obtained with a continually diminishing expense, and in many cases with an absolute improvement of the soil. This is the goal towards which a true and perfect system of agriculture should ever be tending—to secure the most desirable and profitable crops with the least expenditure of labor and fertilizers, and, at the same time, to enrich the soil and enhance the salubrity of the climate and the beauty of the landscape. The effect of modern improvements applied to estates in England during the present century has been to increase their annual value many fold. This result has been attained by thorough tillage, clean culture, under-draining, rotation of crops, cultivation of roots, improved methods of saving and applying manures, use of commercial fertilizers, and proper adaptations of crops to soils and markets, together with the application of horse and steam power to farm work and the invention of many new and useful hand implements; the irrigation of "water meadows;" the introduction of better breeds of animals for specific purposes, and the diffusion of knowledge upon topics of interest to the farmer.

In our own Commonwealth the change for the better is almost as marvellous. How different the appearance of the country to-day from what it was a hundred years ago! What improvements in the variety and quality of farm and garden products; in the number and perfection of agricultural implements and machines; in the treatment of swamps and other wild or waste land; in roads and fences; in orchards and vineyards; in the location and construction of farm buildings; in the beauty, usefulness and value, and the care and breeding, of domestic animals; in the saving and appreciating of fertilizers and in general farm management, and above all in the intelligence and eagerness for progress of the farmers themselves. This increased mental activity and desire for information is clearly indicated by the enormous sales of agricultural books of every description, and the almost incredible circulation of agricultural periodicals, which have come into existence within a comparatively few years.

Not only have the out-door labors of the farm been rendered much lighter, more agreeable and more profitable by these modern betterments and inventions, but the household duties of the farmer's wife and daughters have been greatly diminished both in number and severity. The quiet enjoyment of domestic life is now possible, even upon large farms, since the rude hired men of the olden times are mostly replaced by the sleek horses which perform their work. The milk train, the cheese factory, the machines for washing and wringing, churning and sweeping, sewing and knitting, and a thousand other improvements lighten their responsibilities, lessen their labors and shorten their hours of toil.

While it is thus encouraging to review the history of our agriculture, it is evident that much remains to be accomplished before our system of farming as actually practised will derive the benefit it ought from the best knowledge of the present day, and the farmers as a class have that degree of intelligence and skill which is most desirable.

We are assured on good authority that the soil of the United States has been devastated and impoverished by our past agricultural operations to the extent of more than $1,000,000,000, and that the loss from poor cultivation of crops—from what Henry Ward Beecher styles the horizontal, in distinction from the vertical method of farming—in the year 1869 was not less than $200,000,000. It is also undoubtedly true that the actual waste of fertilizers from want of proper shelter and care amounted in the aggregate to many millions of dollars. Even in Massachusetts there are probably 75,000 barns to-day without cellars or other suitable means for saving the more valuable portion of animal excrement.

It may be safely asserted that money wisely applied to the advancement of agriculture is most profitably invested. When Henry Colman was occupied, from 1836 to 1840, as commissioner in making an agricultural survey of this State, there were many even among the farmers who regarded his work of little if any value, and it was finally suspended before its completion for want of an appropriation from the legislature. In his final report he says, that the total expense to the people had been about one cent for each inhabitant, and that one of the best informed men in the State had expressed the opinion that it had already been worth thirty times its cost in its beneficial effects upon the agriculture of the Commonwealth. If he had been instrumental in reclaiming an average of three acres of peat bog in each town, as he supposed he had, he shows that he had thus created property worth at least $150,000 and yielding an income of $20,000 per annum. If he had led to the making each year in every town an average of two hundred loads of compost worth one dollar more a load than it cost, he demonstrates that he had thus developed an annual income of $60,000.

The money expended was therefore obviously returned many times over during the progress of the survey, and will be every year while agriculture is practised. It is an important fact that such agencies for good, once put into operation, continue with constantly increasing power to benefit mankind to the remotest generation.

Near the beginning of the nineteenth century, when the science of chemistry was rapidly assuming its present form and revealing to the waiting world the wondrous truths relating to the composition of soils, water and air, the food of plants and animals, and the true relations of the three kingdoms of nature to each other, Sir Humphrey Davy published his great work on Agricultural Chemistry. The deepest interest in regard to possible improvements in agricultural operations by the direct application of science was excited in the minds of many most intelligent men, both in this country and in Europe. It had been for centuries previous to this time the belief that chemical science could devise some method for transmuting the baser metals into gold. Kings, nobles and scholars had been alike interested to secure this result, but chemical analysis demonstrated that it was no longer to be hoped for.

The enthusiastic devotion of the alchemists to the mystic science was now in a measure replaced by the unwarranted expectations of those who sought the advancement of agriculture. Many imagined that chemical analysis was to reveal at once the causes of sterility in soils, and to discover forthwith some simple but sufficient remedy. This resulted in an immense amount of chemical investigation into the composition of soils, manures, plants and animals, which is still in progress, and though the precise object of search has not been discovered, a vast amount of valuable knowledge, both theoretical and practical, has been attained. The methods of enriching soils, preparing and applying manures, stimulating plants to produce the crops desired, and feeding animals for special purposes, which have been devised by intelligent men under the guidance of science, have been, and will to the end of time be, of inestimable value to the world.

The surpassing worth of any, even the smallest improvement in agriculture, and the rapidity with which one invention followed another, awakened the public mind to the necessity of some new means for the diffusion of knowledge, and for the excitement among farmers of a desire for better tools, seeds, stock and methods. Hence the organization of agricultural societies, which aimed to accomplish these results by the publication of useful information, by the discussion of various important subjects, by the exhibition of the best agricultural tools and products, and by the offering of premiums for the trial of experiments, the invention of improved processes or implements, and the production of the largest crops, the finest specimens of the most desirable farm produce or domestic animals, and for the best essays upon specified topics.

The Massachusetts Society for the Promotion of Agriculture was incorporated in 1792, and has always been composed largely of gentlemen of wealth and culture, residing in Boston or its vicinity.

In addition to the other more common modes of advancing the interests of the great art, this society has repeatedly imported valuable animals of choice breeds from England and France, and distributed them for service in various parts of the Commonwealth. The farmers of Middlesex County organized a society in 1794, and those of Berkshire in 1811. The people of other counties soon followed their example, until now there are thirty incorporated societies enjoying the liberal patronage of the State. Most of these own from thirty to sixty acres of land and suitable buildings for their fairs, which are attended by from 3,000 to 25,000 visitors. Their total real and personal property amounts to $350,000, and their annual premiums exceed $25,000.

The New England Agricultural Society, under the leadership of its talented founder, Dr. George B. Loring, in addition to its most successful annual exhibitions, has instituted at the farm of the Massachusetts Agricultural College grand trials of the implements and machinery of husbandry. These have awakened much interest and competition among manufacturers throughout the United States, and have been exceedingly serviceable to the farmers of New England, affording them the opportunity of seeing in operation a great variety of the best machines.

After the first establishment of agricultural societies, the next step for the improvement of our farming was the employment, already alluded to, of the learned commissioner, Henry Colman, to make an agricultural survey of the State, and suggest measures for promoting this important interest. From his entire familiarity with the history and progress of English agriculture he was admirably qualified for the task. In his final report he urges the necessity of *special education for farmers* as follows: "In order to render the agricultural profession more attractive and respectable, we must seek its intellectual elevation. Improvement of the mind confers a rank which wealth cannot purchase, and commands a respect which the proudest aristocracy may envy. It is too late in the day to decry the value of science in agriculture. Who can name an art, or trade, or business, in which knowledge is a disadvantage or a prejudice to success, or in which, indeed, it is not a substantial help? Why should agriculture, combining as it does so many reasons and opportunities for the application of skill and knowledge, be an exception to every other art and business?"

The first effort to carry these ideas into practical operation was not made till 1850, when Hon. Marshall P. Wilder, then president of the Norfolk Agricultural Society, and also president of the Massachusetts Senate, introduced a bill, which passed the Senate, but failed in the House of Representatives, authorizing the governor to appoint a board of ten commissioners who should have power to establish an agricultural school or college, and who should consider the expediency of the formation of a board of agriculture as a department in the State government. The result was that a commissioner was authorized, and Dr.

Edward Hitchcock was appointed to visit and report upon the agricultural institutions of Europe. This report was made to the legislature of 1851, and contained a detailed account of more than 350 schools.

One recommendation of the commissioners, based upon this report, was, that the legislature establish a central agricultural college, with a model and experimental farm. Another recommendation was that a State Board of Agriculture be created, with a permanent secretary and office at the State house, for the collection of agricultural statistics and information, and the advancement of the farming interests of the Commonwealth.

The operations of the Board of Agriculture, as recorded in its annual reports, are too familiar to need rehearsal. It has most nobly done the work for which it was created, and by its constant advocacy of agricultural education prepared the way for the success of the Massachusetts Agricultural College, which was finally incorporated in 1863.

It has been customary in years past for most of the societies to have an annual address, which has usually been printed. These addresses have generally been delivered by distinguished clergymen, lawyers, physicians, professors or editors, and the prominent theme has been education, brains, science for farmers. Wise and eloquent as these orations have been, it is to be hoped there will, at no distant day, be educated farmers who can speak for their own profession with even greater effect. It should then, however, be gratefully remembered that up to the present time almost every successful attempt at improvement in the agriculture of Massachusetts has been originated and prosecuted by educated men who did not belong to the class properly called farmers.

When, in 1862, the national government granted 360,000 acres of land to Massachusetts for the establishment of one or more colleges for the education of the industrial classes, the advocates of agricultural education perceived that the long-looked-for day had dawned, that their often deferred hopes were about to be realized. It was conceded at once by all, that provision should now be made for the special instruction of farmers. His Excellency Governor Andrew, the legislature of 1863, the Board of Agriculture, and all who were for any reason interested in the subject, began an earnest and thorough discussion of the question, how the fund accruing from the sale of this land could be best applied to promote education in agriculture, and thus to elevate the profession and perfect the art.

Three distinct plans for the accomplishment of the desired object were brought forward and ably advocated by their friends. The first was eloquently presented by the governor in his annual message, in which he advised the establishment of an agricultural school in connection with Harvard College, and the bestowment of at least two millions of dollars, in addition to the fund derived from the sale of the land, upon that institution, so as to render it a grand university worthy the name and fame of Massachusetts. The prime object of an agricultural school of this kind is not to educate farmers, so much as to advance scientific agriculture, by affording at the university the most favorable opportunities for experiments and original investigations in the various departments of science which are specially applied to agriculture. Such an institution would, undoubtedly, under good management, accomplish much for the advancement of useful knowledge, and is now organizing as a department of the university of Cambridge, which has a fund of $250,000 bequeathed to it for this very purpose by Benjamin Bussey of Roxbury.

A second plan for promoting agricultural education, which has been urged by some intelligent men, the most prominent of whom is the Hon. George S. Boutwell, is diametrically opposed to the first, and has for its main object the diffusion of knowledge upon agricultural topics among the farmers themselves. The means to be employed for this purpose are not colleges or professional schools, but agricultural societies, farmers' clubs, and lecturers going from town to town, and imparting such practical knowledge as the farmers are competent or willing to receive. Some would also introduce an elementary text-book on agriculture into the common schools, with the same end in view. The attempt to teach agriculture in the public schools, even with an excellent text-book, has been tried and proved a failure from lack of knowledge and interest on the part of teachers. With competent instructors, it might be very profitably taught in the higher schools. The objections to this second plan are that it is hard to teach old men new ways, and hence education must begin in youth; that to secure the ready adoption of improvements there must be not only a knowledge of the improvements themselves, but also of the scientific principles upon which they are founded; that if practical farmers are to remain ignorant of all the higher branches of learning, and to have only the mental discipline and culture of the country public schools, they can never occupy their proper position in society, nor retain upon the farm their more talented and ambitious sons and daughters; and finally, that the stream will not rise higher than its source. The supposition that the mass of farmers will ever educate themselves, or even appreciate the advantages of high culture, before means are provided for giving it, and the benefits of it demonstrated, is without foundation. Most of the leaders, in all the improvements that have been made, have been not ordinary, uneducated farmers, but men of other professions and liberal education. Our State system of public schools, maintained by voluntary taxation, has been referred to as a proof that the farmers would see their need of education and then spontaneously provide for it. But Harvard College was established before the system of public schools, and the high culture of her professional men has ever been the glory and the power of Massachusetts. The history of the schools throughout the State shows that they have been brought to their present state of efficiency by the persistent and laborious efforts of liberally educated men, and in many towns it has required years of warfare to bring the people up to the standard of the laws, which have been devised by learned, and not by ignorant legislators.

The third plan was proposed by the joint special committee of the legislature of 1863, the chairman of which was the Rev. E. O. Haven, who has since gained the reputation, in connection with the University of Michigan, of being one of the most successful educators in the country. He is now president of the North-Western University near Chicago.

The fundamental idea of this plan was the establishment of a strictly professional school for farmers, as an independent institution. It was regarded as important that it should be in an agricultural region, away from city influences, and that it should equal, in its educational facilities, the other colleges of the State. Its object was to teach the theory and practice of agriculture, and to give its pupils a literary and scientific training of a high order. It was to be well equipped with apparatus and books, a farm with stock and tools, and the necessary professors, not only to systematize and teach all useful agricultural knowledge, but also to make original investigations and experiments for the advancement of the art.

The Board of Agriculture heartily approving this plan, it was adopted by the legislature, and the Massachusetts Agricultural College was incorporated. It is somewhat remarkable that it is the only institution in the United States designed exclusively for the education of farmers. The members of the corporation were elected by the legislature for life, and were chosen from among the prominent friends of agriculture. Subsequently the Board of Agriculture was made a Board of Overseers of the College.

It having thus been decided that the farmers were to enjoy the benefits of an independent, professional school, its precise character and location came under consideration. The law required that it should be called the Massachusetts Agricultural *College*, from which it must be inferred that the legislature designed it to hold a prominent position among our educational institutions. The course of study and instruction was obviously intended to be superior, at least in some respects, to that of our existing public schools; and to secure the proper establishment of the college upon a basis satisfactory to the people, it was required that the location, plan of organization, and course of instruction, which might be adopted by the trustees, should be approved by the governor and council, before any decisive steps were taken for its erection.

President Henry F. French, having given the subject of agricultural education a great amount of attention, and having visited the principal schools and colleges of this country and of Great Britain, prepared a plan for the establishment of the college at Amherst, which was unanimously adopted by the trustees and approved by the governor and council.

An excellent farm, of nearly four hundred acres, having been purchased in the valley of the Connecticut, and suitable buildings completed, the college received its first class on the second of October, 1867. On that day thirty-three young men, averaging nearly eighteen years of age, most of them sons of farmers, presented themselves for examination. The growth of the institution, so far as money and members are concerned, from that time to the present, has been constant and rapid to a degree which has satisfied its most hopeful friends. Its estate, buildings and equipment have cost more than $225,000, and it has a cash fund of $150,000. Its organization is now complete, and with a competent faculty of instruction, and four classes of students, numbering in all one hundred and twelve, it may, without any boasting, be affirmed that no institution in the country, among all those endowed by the national government, offers better facilities for agricultural education than the Farmers' College of Massachusetts.

Having thus considered some of the more important facts concerning the efforts made during the present century, by enterprising men of science and political wisdom, for the advancement of agriculture, we come to consider the obstacles to complete success in this last and noblest attempt to increase the intelligence, wealth, power and popularity of the profession so largely and so well represented here to-day.

In the report of the committee, which accompanied the Act of incorporation, passed by the legislature of 1863, occurs this somewhat remarkable sentence, which has proved to be almost prophetic: "There can be but one serious impediment in the way of making a true professional agricultural school in this State prosper, and that is a want of interest in it among the agricultural population."

To one who understands fully the greatness of the preparatory work which has been done at Amherst, and the advantages there offered'for practical training, scientific instruction and original investigation, the utter indifference in regard to their college manifested by most of the 75,000 farmers of Massachusetts is truly astounding. It calls to mind the almost incredible fact in the history of the South Sea Islands, that, in 1797, thirty-nine English missionaries, with every needed appliance for teaching Christianity and the arts of civilized life, began their earnest and devoted labors for the elevation of the native population, but did not succeed in making a single convert during the first sixteen years.

It was the belief among the pioneers in the missionary work that if men could but see the advantages to be derived from Christian civilization, they would readily accept it; but experience has demonstrated that efforts for the improvement of a people are most wisely directed to the mental and moral culture of the young.

It is therefore obvious that while much benefit may result from public meetings for the discussion of practical questions, and from the publication of agricultural documents, which in the form of books and periodicals are now spread broadcast over the country, yet the real want of the times is thoroughly educated farmers—men who combine exact science with profitable practice. We have workers enough, writers enough, and talkers in excess. Let us have the three in one. Let us have men prepared for this profession by years of study, during which they shall not only become familiar with all the most important knowledge pertaining to the subject, but shall acquire, by thorough discipline, that ability for close observation and accurate experiment which is indispensable to any considerable progress. This is the needed remedy for that crudeness and superficiality and frequent worthlessness of agricultural literature of which we are all the constant victims.

But just here we are met by the popular notion that much culture is incompatible with manual labor, and that the farmer who sends his son to college for education, will find that as he increases in intelligence he will decrease in industry, professional zeal and capacity for successful farm management.

Now, to assert that a young man cannot be immensely strengthened and benefited by special, scientific preparation to practise agriculture, is to admit that though so loudly praised as the first, last and noblest occupation of the race, it is really degrading in its nature, and designed, in the organization of society, only for those poor, stupid, ignorant or unfortunate persons who are unable to secure a livelihood in any other way—a doctrine which the Massachusetts farmers are hardly ready to accept.

But perhaps the inquiry may arise, Why the graduates of our older colleges are not more commonly found engaged in agriculture, if it be so excellent a business and one so greatly advantaged by education? The explanation is obvious and most satisfactory.

In the first place, the course of study is not at all adapted to qualify a man for farming. Seven years of the best of life are necessarily spent away from all practical pursuits, and almost exclusive attention given during most of this period to the dead languages, pure mathematics and metaphysics. The natural sciences and mixed mathematics are studied comparatively little, and without reference to their application to agriculture, or any other art.

Again, nearly all students when entering upon a classical course have in view one of the three learned professions, and naturally come to regard themselves as rising above the level of the agricultural community, precisely in proportion to the extent of their literary attainments.

Finally, most college graduates are destitute of any other capital than their education, and are therefore compelled to begin life in a small way by teaching, or the practice of a profession which requires but a moderate investment of money. Without land, stock, tools, or ready cash, without a knowledge of business in general, or farming in particular, and without the respect or sympathy of the farmers themselves, the graduate of a classical college has few inducements to enter the profession.

Let no one, however, imagine that study tends to indolence, or that professional men are less laborious than farmers, or that an educated farmer will accomplish less than an ignorant one. It has been well said that "what is often called indolence is, in fact, the unconscious consciousness of incapacity." On the other hand, knowledge is power, and its conscious possession must render the farmer, as well as every other man, more ambitious, more energetic and more efficient. Genius has been well defined as capacity for labor, and the most patient and enthusiastic workers of the world are the great scholars. Thought is "brain-sweat," and mental labor is vastly more exhausting than the exercise of the muscles ; yet there are multitudes of studious men who toil more hours every day than the most diligent of farmers.

Professor Agassiz while engaged in writing his great work upon the glaciers, after spending some months amid the everlasting snows of the Alps, remained for two whole years in gown and slippers, as it were in a chrysalis state, before astonishing the world by his appearance as the author of one of the most surprising and original scientific theories ever propounded. Who of us could be hired to perform one-half the filthy, disgusting work, in collecting and handling fish, which Agassiz has voluntarily done in acquiring that knowledge which has made him the greatest ichthyologist of all the ages? Who can realize, while listening to his brilliant and instructive lectures or conversation, that he has been the most laborious and zealous collector of specimens in zoölogy ever known; or that he, of all men, should have passed many of the best years of his life in studying the embryology and habits of the slowest and coldest-blooded quadrupeds—the turtles? When importuned to leave this apparently unprofitable and disagreeable labor to engage in lecturing, which seems to most persons so much more useful and delightful, and by which he could readily amass a fortune, he answered with most unselfish devotion to the cause of science, "I cannot afford time to make money." Education certainly did not spoil him for work, and the people need have no fear that their sons would become unfit for labor, if sent to Amherst for instruction.

But from present indications it would seem that scientific attainments and professional training for farmers are not very highly esteemed in this part of the Commonwealth. While the wisest statesmen and the most intelligent friends of progressive agriculture are profoundly impressed with the necessity of special education for that business, and while institutions for this purpose are being numerously established and richly endowed in all civilized countries; while Prussia, whose power and resources now astonish the world, is justly celebrated for the number and surpassing excellence of her agricultural schools; and while the Massachusetts Agricultural College, with its beautiful farm, its commodious buildings, its ample equipment, its competent instructors, and its crowd of students, invites their attention and patronage, what is the interest manifested in this momentous subject by the citizens of Berkshire?

Precisely this. With a population largely engaged in cultivating the soil; with three flourishing agricultural societies; with three members of the Board of Overseers and two of the trustees of the college residing among them, and with the standing offer of a free scholarship to any suitable applicant, not a solitary student has appeared for admission to the college this year.

Now in trying to account for this surprising fact, no man can truthfully affirm that the education there given is not suited to the wants of a practical farmer; or that it is inferior to that offered at any other agricultural college in the country; or that, under all the circumstances, it could reasonably be expected to be better than it is. The college is by no means perfect, but its warmest friends are found among those who are most familiar with its history and operations. The thirty young men who have been there three years, and are now engaged in the studies of the fourth year, are too intelligent and shrewd to be deceived in regard to the character and value of the education they are securing. The truth about the matter is simply this:—the farmers do not realize that the greater includes the less; and the very men who would be most enthusiastic over a new churn, or a seedling potato, or a recipe for some patent fertilizer, fail to see that the direct road to all possible improvement lies in the development of mental power, and the acquirement of scientific knowledge. This manifest disregard of the agricultural community for their college, affords the most unanswerable argument to those who for any reason wish to defeat the legislative appropriations necessary for its development and support. Even those who admit the propriety of special governmental aid to promote the farming interest, and who believe great good might result from such an institution properly patronized, must soon become disheartened in the vain attempt to help those who will not help themselves. Time-serving politicians, and unprincipled newspapers, seeking only to float on the tide of public opinion, will, of course, readily unite in an opposition, which appears to be popular, and eagerly seize every opportunity to prejudice the people against the enterprise and its friends.

Massachusetts promptly accepted the generous grant of the national government and in good faith provided an independent school for the special education of young farmers. No other preparation is required for admission than can be obtained in every town at the public expense. The students all reside on the State farm, and are every day engaged in the study and practice of agriculture. The course of instruction has been adopted after the most careful investigation into the organization of similar institutions in other countries, as well as in the United States, and after five years of discussion and trial by the trustees and faculty. Much effort has been made to secure the services of professors and lecturers distinguished not only for scientific attainments and general culture, but for practical skill in their several departments; and particular pains have been taken to reduce the necessary expenses of the students to the lowest practicable point. In short, every exertion has been made to establish a true professional school, fitted to educate in the best manner the leaders of our agricultural population. All this has been accomplished, but the principal work yet remains to be done. There can be no complete and satisfactory success until cordial coöperation of the farmers themselves has been assured.

The danger concerning the college is not that it will lack students, for it is full; or appreciative friends, for their number is large and constantly increasing; or necessary funds for its maintenance, for it is well endowed. But the difficulty is to preserve its peculiar agricultural character, upon its present economical basis. Unless the farmers will feel more responsibility in the matter, and make more effort to educate for their profession young men of enterprise and ability, and send to the legislature representatives and senators who shall be willing to carry out with wise liberality the plans which have been adopted, it will be impossible to retain the tuition at its present low rate (which is not one-quarter of the usual charges at institutions affording similar advantages), or to give to agriculture that special prominence in the course which it now has. It should be remembered that there will always be many influential members of the legislature, from various professions and localities, who will know little and care less about the college; and unless the class for whom the State has established it rally around it and give it their hearty support, they will inevitably lose those valuable privileges which are now so freely offered them. Already the Secretaries of the Boards of Education and Agriculture are instructed to inquire and report at the next legislature whether the college can be made self-supporting. The educated men interested in other schools and colleges are jealous of this new rival, and will not permit appropriations from the State treasury for its benefit, unless they are earnestly demanded and wisely improved by the people.

The farmers, then, ought to rejoice in the fact that they have a college for the education of their sons, and they ought to bestow its advantages also upon their daughters. They should not regard their most talented children as too good for the profession of their fathers, but should afford them every facility for the best possible preparation to honor and to elevate it. They should resist all attempts to reduce the standard of agricultural education, and clearly understand that, if nine years are required to qualify a lawyer, minister or physician for his duties, no farmer can reasonably claim to be thoroughly instructed in his profession, and fit to enjoy full equality with other educated men, who has devoted less than four years to the acquisition of discipline and knowledge. They should take care to be well and truly represented in the general court by men who will see that their college suffers no detriment, and that its essential wants are promptly supplied.

Every farmer should secure a copy of each annual report of the trustees, that he may learn the facts respecting the real condition and working of the institution, and so be able justly to appreciate its merits, in spite of the unfair criticism which sooner or later assails every enterprise under State direction, however beneficent its object or judicious its management.

Mr. President, there can be no more appropriate or eloquent conclusion to these remarks than the peroration of an address on Agricultural Education, delivered before this society in 1853 by the Hon. Henry L. Dawes, who has been so long your illustrious representative in Congress, and who, in 1862, efficiently aided in securing from the national government a munificent endowment for the very institution for which he then so ably pleaded. May his exhortations and warnings add tenfold force to the words already spoken, and stimulate every farmer present to a faithful performance of his duty towards the Massachusetts Agricultural College and the cause it represents:—

"Gentlemen, I have sought on this occasion to draw your attention to your position and duties, and to the radical defects and short-comings in all our struggles to elevate the standard of agriculture in this Commonwealth. I have also attempted to point out the remedy to be a systematic, a thorough and a liberal professional education for the farmer, furnished by the State coöperating with private munificence. And on an institution thus founded and endowed I have endeavored to ground your hopes for the regeneration of the soil of the Commonwealth, and for the proper elevation and true dignity of her sons.

"And permit me, finally, to add, that it lies with yourselves, under a gracious Providence, to say when this golden age shall be ushered in. For though you cannot build this great temple with your own hands, yet you may give tone to the policy of our common government, which can lay its foundations deep as perpetuity, and spread its ample arches broad as the land. You are, in the multitude as well as in the individual, the architects of your own fortune.

"You may, by indifference, suffer the half-finished walls of this temple to tumble down in neglect, or rise, if at all, disproportioned and incongruous, repulsive to the votaries at its shrine, inefficient in its influence and abortive in its mission—or you can, if you will, adorn and beautify its rising columns, crowd its broad and lofty portals with devotees bringing their sheaves with them and fixing their trophies in its very dome, till it shall become the just pride, and, under God, the ultimate preserver, of the Commonwealth. Build ye for yourselves and for posterity."

THE FARMER'S ADVANTAGE.

Address before the Hoosac Valley Agricultural Society.

BY A. L. PERRY.

My topic is the Farmer's Advantage; by which I mean the tendency of all that the farmer has to sell to buy more and more of all that he has to buy. There is a natural tendency which God has inwrought into the framework of things, and which science has demonstrated beyond a question, in accordance with which a load of hay, a bushel of wheat, a pound of cheese, and all farm products whatsoever, tend perpetually to buy more, rather than less, of cloth, of clocks, of cutlery, and all manufactured articles whatsoever. This tendency I call the farmer's advantage, because the things he has to sell are agricultual, and the things he has to buy are manufactured. Unless the natural and proper condition of things be thwarted by the foolish legislation of men, the products of the farm will command, as time goes on, more and more of the products of the factory.

Let me illustrate in two or three articles the important natural law of which I am speaking. At the beginning of this century a pound of raw cotton was worth about twenty cents, and a yard of cotton cloth about sixty cents; consequently it took at that time three pounds of the agricultural product to buy one yard of the manufactured product. From that day to this the power of a pound of cotton to buy cotton cloth has been steadily increasing, until now, one pound of raw cotton will buy one yard of cotton cloth. Seventy years ago it took three pounds, now it takes but one pound. Thus the purchasing power of raw cotton, the agricultural product, over cotton cloth, the manufactured product, is three times as great now as it was then. The price of the cotton has indeed declined, we will say from twenty cents to fifteen; so that while in seventy years the agricultural product has only lost one-fourth of its value as estimated in money, the manufactured product has lost three-fourths of its value as estimated in money, while as estimated in each other the cotton is three times as valuable now as it was then. This simple example, which is a perfectly fair one for our purpose, throws the principle we are unfolding into a strong light.

But take another instance. Old uncle Eli Porter of Williamstown used to make brass clocks, which were sold for about $70 apiece. Seventeen years ago I bought of George B. Perry a brass clock for $7, which keeps as good time, and for aught I know will last as long, as uncle Eli's. If corn was worth a dollar a bushel when the Porter clocks were sold, it would take seventy bushels of corn to pay for a clock. Corn is worth about a dollar a bushel now, but seven bushels of it will buy a clock probably as good as those clocks were, so that the power of a bushel of corn to command a good clock is ten times as potent now as it was fifty years ago. Thus we have another illustration that what the farmer has to sell tends to buy more and more of what he has to buy. On the whole, the price of corn has kept pretty steady thoughout this century thus far, but the power of a bushel to buy most other things has kept steadily increasing throughout this country thus far. If we had at the present time in this country a sound currency, and a free system of exchange with our neighbors of other nations, both the general principle of which we are speaking, and this particular illustration of the corn, would appear in a more striking light than they now do. But notwithstanding the badness of our currency and the restrictions on our trade, the truth still maintains and illustrates itself on every hand that the products of the farm are constantly becoming more valuable relatively to the products of the factory.

I shall now give three reasons why this is so. Of these the first is, *that machinery can be applied more completely in manufactures than in agriculture.* The effect of the use of machinery is always ultimately to cheapen the article produced by its help; since machinery itself is nothing but an expedient to take off labor from human muscles and throw it on the ever-willing shoulders of Nature. To replace an expensive agent, namely, human labor, by a gratuitous agent, namely, a force of Nature, cheapens the product. The only motive for the introduction of machinery ever or anywhere is to make water, air or steam do a part of our work. But we pay Nature absolutely nothing for these her forces. Therefore man will not pay us for what costs us nothing. Therefore the more machinery that is employed, the cheaper so far forth will be the product. But from the very nature of farming, machinery can never be employed in it to anything like the same extent as in manufacturing; because the processes of farming are so varied and multiform, so dependent on location and weather, so different in different circumstances, in one word, because while the processes of manufacturing are mechanical, the processes of agriculture are vital, that is to say, have to do with life and growth. So far as machinery can be employed on the farm, it ought to be, of course, and it will be under pressure of the same motive as leads to its use in the mill; but for the reasons just given it never can be used to the same extent on the farm as in the mill; and here we find the first fundamental reason why farm products, which are mainly created by human muscle, become more and more valuable as compared with factory products, which are mainly fabricated by the free forces of Nature brought to bear through machinery.

The second reason for this is, *that division of labor cannot be applied in agriculture as it is applied in manufactures.* In the factory, as a general rule, each person does one thing and nothing else. The spinner spins, the weaver weaves, and the finisher finishes. Division of labor cheapens productions; because it imparts dexterity, saves time and tools, leads to inventions, and distributes the laborers according to their strength and skill, to the processes according as they are more or less difficult. But on a farm there can be comparatively little of the division of labor. The same hand that holds the plough must sow the seed and reap the grain. One man must be familiar with many processes. The farmer must pass from one thing to another continually. The old fellow whose conscience troubled him for not paying for his newspaper illustrates this point very well, though his verses are rather homely :—

"I ploughs, I sows,
I digs, I hoes,
I gets up wood for winter;
I reaps, I mows,
I 'taters grows,
And yet for all I knows
I'm 'debted to the printer.
I do suppose
All larnin' flows
Right from the printing press;
So off I goes,
In these 'ere clothes,
And settles up, I guess."

This variety of avocations, though favorable in some other respects, is not favorable to cheapness of production. There is involved in it a loss of dexterity, of time, of tools, of inventive skill, and of an economical distribution of labor. Therefore farm products created under this disadvantage have an *advantage* in point of value over products to whose fabrication division of labor contributes more.

The third reason is, *that nothing can materially shorten the time during which farm products mature.* Not so the processes of manufacture. They can be hurried up. The wool that is on the sheep's back to-day may be scoured to-morrow, dyed the third day, spun the fourth, woven the next, finished the next, the tailor's shears may be in it as soon as Sunday is over, and a man may walk in pride in what ten days before clothed the humble sheep. So of most other processes of manufacture; they can be put rapidly through; and the manufacturer may speedily realize on his completed product. But the farmer must watch and wait. No diligence of his can ripen his grain one moment before the time. He must have the former and the latter rain. He must wait on the seasons. He can rarely realize on his efforts in less than a year's time. But when in God's time, and by God's blessing, his corn is ripe and ready for market, his fruits are gathered, and all his products offered for sale, he finds year by year, if he is a careful man, that his corn will buy rather more cloth, his butter rather more buttons, his hay rather more harness, his cheese, roots, beef and wool rather more of all those manufactured articles which he has occasion to procure. He may not know the reasons of this, but I have now given him the reasons; the fact may be disguised from his notice, and if he notices it, it may seem to him less important than it is; and he may even doubt the principle itself, but the principle will vindicate itself in spite of his doubts.

Does it seem strange to any of you that I urge what may appear the disadvantages of farming as the farmer's advantage? The three differences which I have just explained between farming and manufacturing are not *disadvantages* to the farmer, but differences which result in his great advantage. If he can but hold his own, that is to say, produce his crops at no greater expense than before, these crops, in consequence of methods which manufacturers follow, but which he cannot follow to any great extent, will purchase more and more of their products. The price of raw materials tends constantly to approach the price of the finished goods made out of them, owing to the less and less cost of manufacture through the increased perfection of machinery; and therefere, he who has the raw materials to sell has a great advantage for the supply of his wants of finished goods. This principle is very important, because it shows that there is inwrought into the very framework of society a provision by which the masses of mankind, who have always been the tillers of the soil, may rise constantly in a scale of comforts as the years go on. This "farmer's advantage" is the law of the progress of the masses.

But, gentlemen, this beneficent principle, by whose action God designs a progressive improvement in the condition of the masses, is more or less disguised and thwarted at the present time in this country by two things, which, if you know your own interests, you will both hate and labor to remove, namely, our depreciated currency and our so-called protective tariff. The currency and the tariff, and if possible the currency more than the tariff, make against the interest of the farmers of this country every day they live. Daniel Webster said a good many good things in his lifetime, but he never uttered a truer sentiment that when he said this: "Of all the expedients for cheating the laboring masses of mankind a depreciated currency is the most effectual." I hold in my hand what is called a two-dollar bill. I will read it: "The United States will pay the bearer on demand two dollars at the treasury at New York." This, therefore, is not two dollars as we are wont to call it, it is a *promise to pay* two dollars. The place of payment is specified—" the treasury at New York." Well, then, suppose you take this promise to the proper place and demand your two dollars. Your demand is refused. The United States acknowledge the debt, but will not pay it. You are bowed out of the treasury, politely perhaps, but more probably with a scornful expression at your greenness for supposing that the government will fulfil its own promise. This, then, is a dishonored note, precisely as your own note would be dishonored at the Adams Bank after the last day of grace had expired. This note has been long dishonored—eight years. It is not only not two dollars, it is only an unfulfilled, long-dishonored promise to pay them. But this is not the worst of it. A protested note necessarily becomes depreciated. This note is depreciated, that is to say, it is not *worth* two dollars. It was worth, on the average of the fiscal year 1869, $1.40, and on the average of the fiscal year 1870, $1.70, as compared with coin, that is to say, as compared with real dollars; for the only dollar known to our laws is the gold dollar composed of 254.5 grains of a metal compound of which nine parts are gold and one alloy. This note promises to pay two *such* dollars. No other *kind* of dollar is possible. Government gave up long ago the attempt to make a commercial dollar even out of silver.

But the trouble with this note is, not any doubt about the kind of dollar it promises to pay, but the fact that its own value as a promise is so variable. At one time this very note of two dollars was only worth 70 cents; now it is worth $1.76, and it has passed up and down every one of the intermediate points. Now, money is a measure of all values, but a dollar so variable in value as this, is totally unfit to be a measure of anything. A uniform measure in the field of values is vastly more important than a uniform measure of length or of capacity. Would an india-rubber yard stick, extensible at will and contractible without will, be a good measure of length? Would it be likely to give good satisfaction to all buyers and sellers by the yard? Would it or would it not throw our agricultural community into confusion, if the bushel measure held three pecks at one time, four pecks at another, and five pecks at another, and was constantly passing from one extreme to the other through the intermediate points? Vastly worse than either of these, or both of them together, is it to have the measure of values, which is the current dollar, variable from day to day and from year to year. Especially is this disastrous to farmers, who make all their calculations in the spring and only realize on them in the fall or winter. Their expenditures are a long way off from their sales. They cannot tell what the dollar is to be. Under a system like this, the farmer does not know what to expect; his business becomes a lottery, his enterprise is chilled, the shrewd take advantage of his ignorance, and all his settled foundations are thrown out of course. Perhaps the great injustice of the legal-tender act, which undertook to make mere promises equivalent to their fulfilment, and which robbed the whole creditor-class of the country of one-third of their debts due, may be justified by the extremity into which we were thrown by the war; but the act added nothing to the resources of the country, it merely made a violent partition of goods among the citizens, and furnished the unscrupulous an opportunity, which they have not failed up to the present moment to improve, by the legalized destruction of the old measure of value, to take advantage of the ignorance and the necessities of the masses for their own profit. The money-changers, the bankers, the brokers, the whole brood of per cents. have rioted in the untold losses of the people. It is almost six years since the war ended, and yet no repeal of the legal-tender act, no intelligent effort to restore the specie standard, no consciousness, apparently, in high places, of the *national disgrace*, in times of peace and providential prosperity, of a thoroughly debauched currency. There is no commercial need in this country at this hour so pressing as the need of an honest dollar! And I invite you all to unite with me in raising the cry, that shall pierce the dulled ears of our rulers, an honest cry for an honest dollar!

In conclusion, gentlemen, and very briefly, let me call your attention to the way in which what is called a protective tariff makes against your interests, and neutralizes the natural advantage that God gave you as farmers. Did you ever think distinctly what a tariff is, and how it works? Is a tariff anything in the world but a combination of taxes which you have to pay? Read the tariff from beginning to end, turn it upside down and inside out, and you will find it nothing under heaven but a schedule of *taxes!* The only thing a tariff says, or can say, is, "*Thou shalt pay!*" It has nothing to give; it can only demand. They who say that a tariff enriches a country, virtually say that a people can be enriched by taking money out of their pockets! Some men say this in ignorance, having never looked into the nature of a tariff, and others say it in craft and guile to deceive the people and make merchandise of them. Now all taxes in their very nature are a burden; they are so much out of our pockets; but you and I are willing to pay all taxes, even tariff taxes, that are laid simply for the support of the government and its credit. But taxes laid for any other purpose than this we are not willing to pay; as men of sense and spirit, we object to paying them, we protest against paying them, and with the help of others like-minded, please God, we shall abolish them! But it is the very purpose of a *protective* tariff, so called, to lay taxes on the people, not for the support of government at all, but to raise the price artificially of certain articles, which you and I have to buy, for the benefit of the "protected" classes. Government gets revenue from a tariff only as foreign articles, subject to duty, come into the country. Protection desires to keep some of these articles out of the country, and thus to cut off the revenue from government, and yet to make the people pay on the corresponding domestic goods the full amount of the tax. You are paying to-day enormous taxes on certain articles, of which taxes government does not get one penny! The people are paying several millions of dollars a year in consequence of a tax on coarse blankets, of which the government does not get one cent! The tax is so high as to exclude the foreign blankets on which it is laid, but the domestic blankets are raised in price in consequence of the tax, and the people pay to the blanket manufacturer, and not to government. So of many other things. "Protection" likes nothing so well as to exclude the foreign article by a tax, and thus take away its revenue from government, but make the people pay the tax just the same. Protectionists, as such, are the worst foes of the government and its credit.

On many other articles the people pay a great deal more in consequence of the tariff-tax than the government gets. The foreign articles are not wholly but only partially excluded; government gets something on what still comes in; but the people have to pay on all they consume, domestic as well as foreign. It is so with salt. You pay a dollar a bushel for coarse salt to salt your sheep, when without the tariff-tax you could buy it for fifty cents easy. But only about half of this extra fifty cents goes to the government; the other half goes mainly to the Onondaga Salt Co. of Syracuse, N. Y., at whose instance the salt duty was put on. So of iron, steel, lumber, and other things too numerous to mention. Protection and revenue are incompatible. Where protection begins, there revenue begins to diminish; where protection ends, there revenue has ceased. On the other hand, revenue is largest where protection is wholly eliminated.

Let no one say that free traders are hostile to manufacturers. They are better friends to manufacturers than the manufacturers are to themselves, so far as the latter are protectionists. The manufacturers of Berkshire County to-day are paying a good deal more "protection" than they get. They would be relieved and benefited if protection were abolished to-morrow. So should we all, especially the farmers. Then let us abolish it. Abolished it will be, either with our help, or in spite of our withholding it.

AGRICULTURE IN EUROPE.

From an Address before the Plymouth Agricultural Society.

BY CHARLES G. DAVIS.

Many Englishmen and many Americans carry England or America with them as they go abroad, and return with very little besides what they took away. But some of us who remain at home, think that we have stricken out a new path, and can learn nothing from the old countries; forgetting that human nature and physical nature are essentially the same everywhere; that all progress and civilization are merely products of the past; that we have no past; and that the past is across the ocean, where science and experience have been garnering fruit for many centuries. I saw the cotton plant near Naples, furnishing raiment and comfort for man upon soils formed of the debris of the volcano which had overwhelmed cities and destroyed a whole people. Those ruins and those ashes thus symbolized a great law, that the present and the future flourish upon the experiences, failures, the debris, nay, the ruin of all which has gone before, just as you enrich your fields from the off-scourings of life and carcasses of the dead.

Passing by, then, all that we learn to avoid from the experience of the past, which in other words is the experience of the old countries, what, as farmers, may we learn to adopt and imitate? To me the first, most striking and impressive lesson was what I may best express in the word "Thoroughness;" and first in *thorough culture*. The advantage and necessity of thorough culture are so apparent in Europe, and theoretically so well recognized here, that I will not enlarge upon them, but content myself with stating that whatever is considered worth doing is worth doing well. The people have learned to act upon this axiom in Europe, but we as a people have not. It is there demonstrated that thorough culture, cleanness, method, system, an accurate knowledge of the wants of plants, and close adaptation to those wants, are the conditions of success, whilst the absence of these qualities is sure to result in entire failure or great comparative loss.

This *thoroughness* applies to everything; but to an American is, perhaps, more striking in the perfection of roads, whether highways or railways, culverts, bridges and tunnels, as well as masonry and engineering of all kinds. You know to how great an extent facility of communication is of benefit to the farmer. You recognize the value of railways, and see how they raise the value of land; you know you like a good highway better than a poor one, but have not been brought to reflect how much economy there is in a good road in other respects than mere facility of transit. It is demonstrated in Europe what the saving is in horses, in carriages, in time, in the increased amount of travel, and, what is more remarkable, that there is saving in the cost of the road itself. A good road, thoroughly built and constantly watched, is cheaper in a series of years than a poorly constructed road, repaired by fits and starts, or once or twice a year; just as you already know that a good carriage or locomotive to run *upon* a road, constantly watched, is the cheapest in the end. What would you think of roads with never a rut, smoother than the sidewalks of your town, rising to points more than 3,500 feet above the level of the sea, cut through rocky promontories, bridged over dry valleys and tumbling waterfalls, rising and falling on even grades or pitches for miles, swept every day, watched as carefully as the road-builders search our railways, tended as a mother tends her child! Yet we have such roads in all Europe, and many of them where the country is not so populous nor so rich as we are. If there is a county commissioner here, or a man who expects to be; if there is in this hall a town surveyor, or contractor, or one who hopes to be, I tell him, as a citizen, that it is his first duty as a citizen to stop this waste; to read and study the essays on road-building in the last State agricultural report; to make himself master of the experience of others who have investigated this subject, and thus learn how little he knows, which is the first great step gained in learning everything.

Nearly allied to this *thoroughness*, thus displayed in careful culture and finished roads, is that stability and permanence which is shown in all structures, from the cart-house, cattle-steadings, barns and outbuildings, to the farm-house, dwelling and palace, in town and country alike. All are built of stone, with partition walls of stone or bricks. I do not remember seeing a building erected of wood throughout England and Scotland, and nowhere on the Continent, except perhaps the roof frames of the poorest cow-houses in Switzerland. But I do not intend to detain you on this topic.

The next great lesson which I think an American farmer may learn from the experience of the past, which is taught by the old countries, is the necessity and economy of dispensing almost entirely with fences on the farm, and in the open country. It has been estimated that more than half a million dollars is annually expended in Massachusetts alone in the erection and repair of unnecessary, perishable, wooden fences; and habit leads us to believe that we cannot dispense with them. In no purely agricultural district which I have visited on the Continent is a fence to be seen. Look along the highways of France and Belgium, go with me down the open valley of the Rhine from Basle to Strasbourg, from Strasbourg to Heidelberg and Frankfort, take the railway through the plains of Bavaria to Augsburg and Munich; extend your survey from Vienna across the plains of Eastern Germany to Berlin; see the long narrow lands, each one a farm by itself, devoted to separate culture. You see no dividing barriers, except a stone post set low in the ground, and no hedge, fence or wall along the highways. The milch cattle are fed in the stalls; the young stock are in the mountains. A pair of milch cows in the field are earning their own living, and saving the labor of the horses, by conveying green fodder to the barn. A woman is cutting the fodder and loading the cart. (I do not ask you to follow her example in this country.) The law of the country, or a custom more binding than law, forbids cattle-grazing on these fields. Here and there is a flock of sheep nibbling stubble, on a strip a hundred feet in width, with grain securely ripening on one side and a neighbor's beets on the other, the land separated by open furrows. A shepherd's dog circles around them and keeps them at home, whilst a boy carelessly loiters in the neighborhood, and occasionally signals to his faithful dog. Animals are led along the highway, and the convenience of a drover is sacrificed to his own convenience as a farmer as well as to the public welfare. But it is not my object to delay you upon this point.

The next lesson which the farmer may draw from the experience of Europe is the value of small farms. Whilst in Great Britain and in parts of the Continent there are large landed estates, the land is nevertheless generally tilled in comparatively small holdings, and, connected with these small holdings, you must remember that agriculture is divided into specialties much more than with us. It would perhaps be difficult to decide which was most the result of the other; whether the small area of cultivation is rather the cause or the result of the devotion of the farmer or the peasant to one or two crops only. Perhaps each custom acts and re-acts upon the other, though both are affected by other considerations. Each of these long, narrow strips of land is a farm, and each is devoted as far as possible to the production of a single crop. For this purpose it may be necessary to vary the product by a certain rotation, but nevertheless the general fact remains that specialties of culture are the objects and the result of successful farming. Here is a strip of vineyard, like a corn-field laughing in the sun ; next to it grain is yellowing for the harvest. There is a strip reddening like a ribbon with clover heads, and beyond it the deep green of the beet leaves shades the ground. This land, in the open country in the neighborhood of Heidelberg, is worth, I was told, 5,000 thalers a metzen, a thaler being about seventy cents in gold of our money, and a metzen less than an acre. But wherever it is possible the land is devoted to a single crop, and one farmer is an orchardist, another is a vine-grower, a third is devoted to flax, another to hops, beets, or the dairy. When we speak of a mechanic we do not mean a man who is a carpenter and a mason, blacksmith and machinist ; why should we speak of a farmer as if he were all-wise in all the departments of his calling ? I say unto you, farmers, devote yourself to some pursuit in agriculture. Raise Jerseys, breed Devons, if you please, but be the genius of Jersey or of Devonshire. Be a pomologist ; make yourself known and beloved the world over, like our honored friend beside me. Devote yourself to strawberries or small fruits ; raise asparagus, train a vineyard, let your neighbors supply your beans and pease, and your incidental wants, but devote yourself to that work of a lifetime, the knowledge of all which appertains to a single branch of husbandry. By so doing you raise your articles or animals cheaper than your neighbor, your product is better and more abundant, and your market is constant, well known to you, and always in the same direction. But time will not permit me to linger upon this topic, of which much has been said already. I content myself with stating that successful agriculture can no longer exist in New England under any other system.

There is another custom, well known in this country, which prevails, so far as I know, throughout Europe, but which we have never adopted. I allude to free and open markets and market days. In every central village, and in every city, on two or three days of the week, you see a large square or a street a quarter of a mile in length devoted to a market. The producer is brought face to face with the consumer, and the household is thus supplied directly from the farm or market garden. Under our system the producer does not obtain a fair price for his labor, the consumer pays an exorbitant price, and one, two, three and sometimes more middle-men take the lion's share. A monopoly is created which to a great extent regulates prices, and produce is often wasted, or given away, or destroyed, to sustain the market. Mr. Quincy has been honored, among many things for which he was so well worthy of honor, for the erection of Quincy Market. I believe it was more injurious to the people of Boston and the Commonwealth than any public act of its citizens. It is reported that while his son was mayor of that city hundreds of bushels of peaches were thrown into the harbor, in preference to effecting a ready sale by a reduction of prices. We have committees of the city and State governments, year after year, who investigate this question. How happens it that nothing comes from these inquiries? We are told that the agricultural interests of the State are on the decline. Let the farming interest of Massachusetts demand a law that every city, aye, and every town of upwards of 5,000 inhabitants, shall furnish free and open market-places for all, protected when required from the inclemency of the weather, and a more lively encouragement may be furnished to the producing interest than all your cattle shows, your Agricultural College and agricultural chemistry and science can furnish in a decade. It is discouraging to the farmer to know that he does not obtain that fair reward for his labor which the consumer would be willing to pay. "What is the price of your strawberries?" asked a friend of a market-man in Boston. "Forty cents a box," was the reply. "But I have strawberries to sell, what will you give?" "Well if they are well picked, I will give you ten cents a box!" No further comment is necessary. This conversation illustrates the whole difficulty.

There is another lesson many Americans learn from a visit across the ocean, which, I doubt not, may appear trivial to many before me, but which to my mind is of vital importance. I do not remember of seeing a roll of hot bread during my absence, and, except in Italy, no bread which was not good, sweet, light, and slowly and thoroughly baked. I cannot speak confidently of the domestic habits of the people. Warm bread or biscuit may possibly be sometimes served in private houses, but not generally, because almost all bread is purchased of the baker. Private cooking is avoided as much as possible. Fuel, especially wood, is dear, and fires are dispensed with as much as possible. Our people do not realize what miserable, sour, heavy, half-baked stuff under the name of bread is served and devoured at the family table in this country; and even this is bolted down steaming and hot. Ladies and gentlemen, you are responsible in most cases for the sin of dyspepsia, so prevalent in this country, so much less known in Europe. When a foreigner comes among you, or an American who has tarried abroad, I recognize, as they do, the anxious and pointed countenances, which are not familiar to their eyes. Other causes may contribute to this national characteristic, upon which it is beside my purpose to enlarge, but bad cooking, hot bread, overhaste and overwork, are the most prominent causes for our continual decline in physical vigor. You are saying to yourselves this moment that these things do not injure you. Ask the physician, inquire of the chemist, question the dentist,—they will give you the same answer.

A large proportion of the travellers from this country whom one meets in Europe are persons who have broken down by overwork, whose nervous system has been disturbed, and who have overtaxed the brain. I am happy to state that few farmers are of that number, but that bad bread and new bread furnish a foundation for much of our domestic invalidism cannot be denied.

Time will not permit me to tax your patience further. I should like to have spoken to you of the cattle of Europe; to have described my visit to the London cattle market, and shown you the crowded rows of long, spreading-horned cattle from Portugal and Spain, the cattle from France, Holland and Belgium, and even from Austria, the thrifty Shorthorn and shaggy, long-horned Highlanders. I should like to have pointed out to you the floral and horticultural beauty of the old countries, and the neatness of the flower gardens and ornamental grounds around every country railway station; to have visited with you Alderman Mechi and his farm at Tiptree Hall, and the Model Agricultural School at Dublin, where I found one farm of five acres, another of twenty-five, and a third of two or three hundred, all carried on separately, as models suited to the capacity of farmers of different means.

FARMS.

WORCESTER NORTH.

Statement of Jabez Fisher.

My farm, which was entered for the premium offered in 1868, to be awarded during the present autumn, was purchased by me in 1854. It contains thirty-four acres, nine of which are covered with growing wood and buildings, ten are in fruit, and the remainder in grass. At the time of purchase, some ten acres were in pasture. My purpose originally was to make of it a fruit farm. That plan has since been adhered to in the main, though the amount of land thus devoted proves to be less than at first intended.

About ten acres were set with orchard in the first two or three years, four and a half in apples, with peaches and plums interspersed, four and a half in standard pears, with dwarfs between, and one acre in cherries, with peaches. The remainder of the tillage land was cultivated with the various farm crops ordinarily grown. After two years' experience, while living at the village, a mile and a half distant, as a practising physician, I came to the conclusion that if I was to make agriculture other than a plaything, I must give it my personal and constant supervision. I then moved to the farm where I now live, and have since that period allowed it to absorb nearly my entire time and attention.

As time passed on, I found that certain products paid a profit, while certain other products either paid no profit or else cost more than they were worth. I had no alternative but to devote myself to the former and discard the latter, as my surplus capital was insufficient to permit me to pursue an unprofitable culture for mere gratification, even if I had been so disposed. Under this rule I have retained fruit and grass, and have given up the growing of corn, grain or root-crops to any extent. I have learned that a field may be kept in grass profitably for twelve years at least without a falling off in productiveness, and without ploughing or reseeding. All of my tillage land that is not in fruit, is kept in grass for hay, and is managed as follows:

My barn is so constructed as to save every particle of the manure, both liquid and solid, in a water-tight cellar. A sufficient quantity of rain-water is added to dilute the liquid portion. Each spring, about the time that the grass begins to look green, the liquid is raised by means of a chain-pump and distributed by a simple box and spreader, upon that portion of the grass nearest the barn. So much of the solid portion as may be needed for any special purpose is removed, and the rest allowed to remain. At any convenient time in late summer or autumn, the accumulated liquid is again spread upon other grass. The solid residue is then entirely removed, and spread upon grass more distant from the barn, choosing each year the portions least productive. This plan has given satisfactory results thus far, and will be continued.

The farm is one field, having no interior fences or walls. Of the division walls standing at the time of the purchase, some two hundred rods, I have removed the whole either into roadbeds, under-drains, or into a vacant corner. The original pasture fields are now either in grass or fruit, and no stock is allowed to be at large upon any part of the premises. In the summer season but one cow is kept, and she is fed in the barn upon early-cut grass and meal. In winter, enough additional farrow cows are procured to consume all of the hay, and they are fed freely with grain, by which means, through the butter made and the increase in the value of the animals, I can realize about twenty dollars per ton for the hay while retaining the manure. At the present time, the probable price for hay looks more promising than the price for butter, and this may change my plans for the coming winter. The purchase of grain to be fed on the farm is very much more likely to increase the productiveness of the soil, than the growing of the same grain in preference to grass. At the present price of labor, I can produce the price of a bushel of corn upon my land easier than I can produce the bushel of corn.

My experience with fruit has been very instructive, if not in all cases profitable pecuniarily. Of the one hundred and ninety-six apple-trees originally set, one hundred and thirty-two have this fall been rooted out. They were sixteen years old, set thirty feet apart, many of the branches meeting, and the trunks fourteen inches in diameter, and less. In growth they have been extremely satisfactory, but in productiveness, much less so. The fact that the canker-worm has secured a lodgment makes the sacrifice less felt. The land thus cleared is to be planted with grapes. Of about six hundred standard pear-trees set, something like fifteen per cent. have died and been replaced by others. Two-thirds of the whole number have grown satisfactorily and look well for the future. Of about eight hundred pears on quince-roots, nine-tenths have seen their day, and, taken as a whole, they have not paid their cost. Nearly all have either blighted, died, thrown out pear-roots, or have been removed, leaving the standards to occupy the ground. Three hundred peach-trees survived from ten to twelve years and produced four very fine crops in that time. Eighty cherry-trees stood ten years, grew very finely, but never produced a bushel of fruit for sale, and were then removed. Fifty plum-trees stood the same length of time with the same results.

Strawberries were grown in quantity a number of years and always at a handsome profit.

The Concord grape I began to set in 1856 and have increased the amount until I have an acre and two-thirds, and propose to add upwards of two acres where the hundred and thirty-two apple-trees have just been removed. This fruit has been an eminently satisfactory product with me, yielding in good years a very large profit, and in the worst seasons giving a better return than anything else grown.

In winter I find sufficient employment in the management of a forcing house used for growing cucumbers for the New York market; two horses are kept and about fifty hens are wintered.

My gross sales for 1868, were, ...	$2,359 95
" " 1869, "	3,848 24
" " 1870, about	3,400 00
Amount paid for labor in 1868, was . . .	632 10
" " " 1869, " . . .	685 66
" " " 1870, about . . .	550 00

JABEZ FISHER.

FITCHBURG, October 25, 1870.

Statement of Cyrus Kilburn.

My farm contains one hundred and twenty acres, is pretty well divided into tillage, mowing, pasturage, orcharding and woodland. I have not kept an accurate account in detail of my farming operations, so as to show a debit and credit side, and be able to strike a balance, and thus exhibit the loss and gain for the last three years; but I will attempt to give some general account of my operations.

In the first place, I raise wheat sufficient for my family, an average of twenty-five bushels a year,—a winter wheat called the blue stem, which I have raised for about twenty-five years without any apparent deterioration.

Indian corn is my staple cereal; I raise from one hundred to one hundred and fifty bushels a year; this year but one hundred bushels, owing to the extreme heat and drought, the heat being almost as unfavorable for making a crop of corn as the drought. I raise from twenty-five to thirty-five bushels of rye yearly; thirty-five bushels this year, the straw selling for $35 at my barn; potatoes yearly, about two hundred bushels, one hundred only this year, fifty of which are the Early Rose, a potato that fills the place so long needed, an early, prolific, good-eating potato; also, one that can be taken from the ground before the potato malaria stalks abroad with destruction in its wake. I cultivate the various vegetables for culinary use, such as cabbages, pease, beans, beets, onions, parsnips, squashes, tomatoes, etc. Also melons of the various kinds, and when I have a surplus of any of them, I dispose of them in the market. My squashes this year, for the first time, have proved a failure.

My hay crop is usually good, sufficient for thirteen neat cattle and two horses, and frequently I sell my surplus hay after wintering my stock. My corn forage is usually equal to three tons per acre, which is cured by cutting up as soon as the ears are well glazed, and stooked, and put in the barn as soon as it is cured enough to keep, although it may mould some, which I consider no detriment to it, thereby being more tender and palatable for the cattle.

My orchard yields a good supply of apples, pears and peaches, for home consumption, and I have a surplus which is sold yearly for about $75.

In the spring of 1869, I procured two hundred peach-trees, which I set out on a piece of ground elevated about one hundred and fifty feet above the meadow bottom, prepared for the purpose and fenced. They lived and grew well, and now look well, notwithstanding the drought of this year, and will commence bearing probably next year; they were selected to raise peaches for the market, many of them being late varieties to supply our market after the Southern peaches have been exhausted. I keep six cows and sell the milk and calves for about $300 yearly. Also, fifty hens to lay eggs for the market, finding them more profitable than swine, especially as I sell my milk.

I have this autumn constructed a dam across the brook flowing through my farm, of sufficient width for a road, to pass over it with my team, which road I very much need to have access to my field lying contiguous to the brook, for the purpose of hauling stones for a fence to enclose the field and to transport manure from my barn to the field, and crops the other way. My intention is to flow my meadow bottom (containing five or six acres) above said dam, admirably adapted for a cranberry meadow, till the grass roots and bushes are killed out, which will take one or two years, and then draw down the water into its natural channel, and smooth the meadow and set it out to cranberries of the most approved varieties.

I have aimed to make such improvements as will in a few years be much more lucrative that at present.

My reclaimed swamp has produced two excellent crops of corn, last year and this, with comparatively little manure, and I think is susceptible of producing many more crops with very little labor, as it is well drained, and has a deep vegetable mould, that will wear like the prairies of the West, and which was, when I commenced, a desolate wilderness.

My wood lot furnishes me with fuel and lumber by its annual growth, sufficient for our consumption and use; and I occasionally sell some.

I have one and three-fourths acres of wheat on the ground, and two acres of rye; and have sold this fall to the butcher one beef creature, and I have three more fattening which will be ready soon for the shambles.

My earnings off the farm go a good way to pay my hired help on it.

CYRUS KILBURN.

UNDER-DRAINAGE.

ESSEX.

From the Report of the Committee.

It has been said that he who makes two blades of grass grow where but one grew before is a public benefactor. Perhaps this assertion should be received with some degree of qualification. Such an one may be so considered if he did it at an outlay that will make it a paying operation. If it is not such an example as would be safe for the ordinary farmer to follow with a limited income derived from his farm alone, then we think it would partake too much of the character of much of the gilt-edged farming which we sometimes see—beautiful to look upon, with the nice-faced walls, the fancy breeds of cows, horses, pigs, and poultry, the nicely shaven lawns, etc. But Mr. Appleton's case stands on no such foundation. Here is really an example worthy of imitation by the men of small means, to say nothing of the improvement in the appearance of his place, lying as the under-drained land did in front of his residence.

The foundation of all the improvement in this, as well as of another larger tract of meadow upon which Mr. Appleton has commenced operations, is a large open ditch passing near this lot and into which the main drain has its outlet, and emptying into Ipswich River, some half mile distant. But as this ditch existed before, we did not think it worth while to make any account of its expense in the drainage of the lot.

Mr. Appleton is fortunate in having for his farmer a practical engineer, who not only laid out the work and made the plan of the lot, but also adjusted all the tile in the drains. This lot was not a muck bed, but a basin kept wet by springs, which had their origin at some low level, as no less than eight were cut through in making the drain. The lot is a long and narrow one, being 1,815 feet in length, and requiring the main drain to be 2,000 feet in length to get an outlet. It contains thirteen acres, one rood and eleven rods. About one acre is taken up by a road way, leaving twelve acres to be operated upon. The soil was a sandy loam on one side, a pretty hard gravel on the other, with some slight elevations, with some decomposing granite cropping out, and a kind of plastic clay in the middle. There were no trees or bushes of any consequence on it, and it was wholly worthless for cultivation.

Operations were commenced in this lot on the 14th of April, 1860, and finished in August of the same year, and it was sufficiently drained to commence planting on the 8th of May, of the present year. The drains being all dug to the right grade, the descent being uniform, any places that might be too soft for the tile to remain in place were filled with gravel before the work cf laying the tile began. The main drain was commenced with one and a half inch tile—the lot being narrow where it was begun—and larger ones were introduced as the work progressed, and it was finished with six inch tile. The fall to the main is on an average five and thirteen one-hundredth inches to the hundred feet, the greatest being thirteen, and the least three and forty-five one-hundredths to a hundred feet, which is thought to be as small a fall as is prudent to lay a drain. The minor drains were laid with one and a quarter, one and a half and two inch pipe, as the nature of the work seemed to require. The main drains were laid some four inches lower than the minor ones, so as to have a slight fall to the water as it entered it, and care was also taken that none of the minors should enter the main drain opposite each other. The drains were generally placed thirty-three feet apart, sometimes a little more, sometimes a little less, as there was more or less water to be taken away. The tile used were the round stone, in sections of about two feet in length, the ends when laid being butted together, and a collar of the same, in the form of a ring, placed around every joint. This form of tile the engineer claims is superior to the sole tile, as the water enters it by filtration. We are not prepared to express an opinion as to the superiority of one over the other.

The value of under-draining depends in a great measure upon the way in which the work is done, because if there should be a slight defect in the work it may spoil the whole operation. In the case under consideration, the end of every section was placed in exact juxtaposition to its fellow; any one not making a good fit, the ends were cut away with a cold chisel. After the tiles were placed, the collar was put over the joint; a sod from the surface was inverted over it, and then the surface soil was carefully packed around and over the tile to the depth of some six inches, and then the ditch was filled with whatever came handy, extreme care being taken not to displace the tile; but we should think, in order to insure the permanency of the work, some leather shavings should have been placed over the tile, after the surface soil had been placed on them to prevent the silt from working through, though it is claimed *that* is not necessary, as the surface soil will answer all purposes.

So much for the work and the way it was done. Now for the expense:

By data exhibited to us the cost of tile was . .	$476 12
Cost of labor, ...	834 00
Making the whole expense, ...	$1,310 12

The cost of cultivation of the crop is set down by the farmer as follows:

Ploughing, part done with one yoke of oxen and a horse, and part with two yoke of oxen, . .	$140 00
Harrowing, ...	34 00
Planting the various crops, ...	120 00
Hoeing, ...	80 00
Value of manure (84 cords), ...	420 00
Add cost of drainage, ...	1,310 12
Balance against the lot, ...	$2,004 12

Your Committee very much regret that this Report could not have been deferred till the crops were harvested, so as to have had the exact amount of the different crops instead of estimates; but as it could not, we were obliged to content ourselves with what we could get, as we do not understand the Society to require a written statement from the claimant. The crops were as follows:

Nine acres of corn, 50 bushels to the acre (this we think a reasonable estimate), at one dollar a bushel, ...	$450 00

One and one-quarter acres of ruta-bagas, eleven hundred bushels (which we think is large both in price and quantity), ...	$550 00
Four hundred bushels merchantable potatoes, measured, ...	400 00
Three thousand cabbages, at six cents apiece, . .	180 00
	$1,580 00

The corn fodder and one hundred bushels of small potatoes are supposed to cover the cost of harvesting.

The manure used was a compost of meadow muck and barnyard manure, two parts of the former to one of the latter.

The corn was planted four feet apart each way, on account of the sod in some part of the land being so tough that it was difficult to obtain soil enough to work the crop.

We arrive at the following results:

Cost of drainage, cultivation and manure; nothing being allowed for the seed used, ...	$2,004 12
Estimated value of crops, ...	1,580 00
Balance against the lot this year, ...	$514 12

We think that the increased value of the land should be considered a fair offset for this amount.

J. L. HUBBARD, *for the Committee.*

RECLAIMED MEADOWS.

PLYMOUTH.

Statement of Philander Cobb.

The piece of meadow I have entered for premium is situated in the south part of Kingston, on the road leading to Plymouth, and contains three acres and ninety-one rods. I bought it in

1865, in a very rough state, covered with bushes and brakes, a part of it rocky. It was very wet and cold, too soft to drive a team upon. In July I mowed the whole piece, burned it over and cut four ditches through the whole, sinking them four inches into the hard pan, so as to drain off all the water. A part of it soon became firm enough to plough; other parts we dug over, filling the holes and covering the wild stuff with sand and soil.

In 1866, I planted the part which was ploughed the year before, with potatoes and cabbages; the crop was small, owing to the land being so wet and cold. In August we covered the two and a half acres, which had been broken up, with soil, put on seventy horse-loads of stable manure and seeded it down, using thirty-five pounds of clover, five pecks of timothy and three bushels of redtop seed. Many would say that quantity of seed was too large, but I worked by the rule laid down in Holy Writ, "as a man soweth so shall he also reap." The seed took well, and in the following year, 1867, it gave a heavy crop of first quality of English hay, eight and three-fourths tons at the first cutting and three and a half tons at the second.

In 1867, I ploughed and dug over the balance of the lot, taking from it at least one hundred tons of stones, selling the large ones and filling cross ditches with the small ones. In August, 1868, I sowed it down in the same manner in which the previous piece had been sown.

The quantity of hay cut in 1868, was about the same as in 1867, except the second crop, which was about three-fourths of a ton. In October I top-dressed a portion of it with stable manure and a portion with leached ashes, at the rate of seventy-five bushels to the acre. The ashes proved to be a better dressing than the manure, and also killed the rust, which had injured the grass the year before. I have used ashes on high land with very satisfactory results, and their use on low land, provided it is well drained, has proved equally satisfactory.

In 1869, the whole lot in grass, I got twelve and a half tons of hay at the first cutting, and one and a half tons at the second. After mowing I put on a slight dressing of manure and ashes.

In 1870, I cut eleven tons of good hay, but the second crop was light in consequence of the drought.

The whole lot can now be mown and raked with horses.

EXPENSES.

1865–6.	Ploughing, ditching, carting sand, etc.,	$366 42
"	Manure and carting,	111 50
"	Grass seed and sowing,	15 00
1867.	Ploughing, getting out stones, etc.,	133 00
1868.	Manure,	80 00
"	Seed,	12 00
1869.	Manure and labor,	68 00
"	Ashes,	30 00
1870.	Manure, etc.,	35 00
Interest and taxes,		85 00
	Total,	$936 72

PER CONTRA.

1866.	Potatoes and cabbages, net,	$50 00
1867.	$12\frac{1}{4}$ tons of hay at $18,	220 50
"	Stone sold,	21 00
1868.	$8\frac{3}{4}$ tons of hay, at $25,	218 75
1869.	$12\frac{3}{4}$ tons of hay, at $20,	275 00
1870.	11 " " at $27,	297 00
	Total,	$1,082 25

The land cost me $200 when I bought it; what it is worth now I am unable to say, except as its value may be computed from what it produces.

PHILANDER COBB.

RENOVATED PASTURES.

PLYMOUTH.

Statement of Spencer Leonard.

My pasture, containing about fifteen acres, came into my possession in the spring of 1855. More than three-fourths of it was cold, moist swale, with clay sub-soil, free from stones. It had, like a large proportion of the pastures in Plymouth County, been managed by taking off all the feed that could be obtained and putting nothing back in return. As a result, the lowest places produced little but bushes and sour grasses which the cattle would not eat, except early in the season, while the remainder was partially covered with laurel, rose-bushes and hard-hack.

In 1855, I mowed the bushes where they were thickest and burned them ; then ploughed about four acres and harrowed as well as was practicable, sowing grass-seed on about half of it in September, and on the rest the next spring, applying no manure except on a small portion of it. The result was a partial failure. I succeeded in destroying a portion of the bushes, but where I applied no manure there was but little improvement in quality or quantity of feed. Where the manure was put there was much more grass of a better quality, but not being properly drained, the cultivated grasses died out in a year or two and the wild, sour grasses took their place. By this time several acres more had been ploughed and treated in a similar manner, with like results.

I now commenced where I began in 1855, but being, like many other farmers, in debt and short of money, I was under the necessity of adopting some comparatively cheap method of draining. As my pasture is somewhat undulating, I ploughed in lands two rods wide, leaving the dead furrows as deep as possible and of nearly an even grade, that the surface water might run off freely ; cutting across ditches where necessary, and harrowed it well, using the grub-hoe and rake where the harrow would not smooth it sufficiently, then applied what stable manure I could spare from my other crops, the chip-dirt and other scrapings I could find about my buildings, some ashes, lime, plaster, and such other fertilizers as I could afford to buy, and sowed grass-seed in August or September, with the best results.

I have usually fenced and mowed it one or two years, and then turned it to pasture, fencing off and ploughing more, to be used in a similar manner. I have now about ten acres, from which, with comparatively small outlay, I have destroyed the bushes, got one or two crops of hay, and my pasture is four times as good as before. Where I have succeeded in getting good surface drainage, I retain the cultivated grasses. Where the water does not drain off freely, the wild, sour grasses come in, in two or three years.

When pastures have been used for a long time, mainly for pasturing milch cows, they become somewhat exhausted of the phosphate of lime and magnesia, which form quite a percentage of milk, and our cows are inclined to chew bones and other substances in order to obtain a supply, frequently at the expense of their flesh and to the injury of their teeth. I would therefore recommend that, in improving old pastures, in addition to draining and a supply of stable manure, leached ashes, lime or other substances containing the phosphate, should be used.

SPENCER LEONARD.

APPLE ORCHARDS.

WORCESTER NORTH.

From the Report of the Committee.

Every farmer should pursue some special branch in agriculture, best suited to his tastes and circumstances; if it is congenial with his taste, and his farm be well adapted to stock growing, that is the branch for him to pursue; if his farm is well adapted to growing vegetables, and his mind leads to that branch of agriculture, it is for his interest to make it a source of livelihood. Again, if he is interested in fruit growing, he should enter into it with his whole heart and make it his leading pursuit. Simply because Mr. Reid, of Westford, or Captain Pierce of Arlington, have acquired little fortunes in their orchards by their care, industry and perseverance, it is no evidence that another individual can, after transplanting the best selected trees in good soil, accomplish the same without farther effort on his part,—he may as well expect to grow a hundred bushels of corn to the acre without any cultivation.

But how painful it is to pass through a section of the country where good, thrifty trees have been transplanted in good soil, and in a few years afterwards to see that grass and weeds and the *borer* have taken possession of the field to such an extent that the money value of the trees is not as many dimes as it should be dollars; yet such is the fact, even in Worcester and Middlesex counties.

Every farmer, however limited his acres, should cultivate a taste for growing fruit sufficient for his own family consumption, and to accomplish the object he need not, unless he pleases, set out more trees than there are months in the year. For summer use we would recommend the Early Harvest and Early Williams; the Red Astrachan also begins to ripen about the 20th of July, and continues to fall till September. For fall apples, the Porter, Foundling and Gravenstein; of this class none supersedes the Foundling, especially for its long duration; the fruit begins to mature in August, and continues to November. Although this variety is not spoken of in the fruit books it may be thus described:

Large, greenish yellow, ribbed mostly, covered with bright red, calyx large, open in a narrow basin, flesh yellowish, quite juicy and melting, a sprightly sub-acid flavor; supposed to have originated in Groton, Mass.; known in Middlesex County by the name of the River apple. Before these are all used, the New York Pippin comes into use, a valuable fruit in November and December. The Mother apple, excellent for family use, large, red, flesh tender and melting,—November to January.

For early winter use nothing supersedes the Hubbardston Nonesuch, but it loses its flavor by long keeping; the Baldwin and Roxbury Russet are too well known to need mention; the latter, if proper care be taken, will keep till June. There appears to be no variety to fill the space between the Russet and Early Harvest except the Runnels. This variety originated in Andover, Essex County; the best recommendation it has, however, is that it is fit for use when others are not to be found, and serves to take the same place in the apple department as the *Madeleine* in the catalogue of pears, very good when others are not to be had.

Soil and Location.—Fruit trees, as far north as Worcester county, should have a southern aspect; if an orchard be transplanted upon the summit or north side of a hill, the bleak winds from the north and north-west cause the trees to have a bend in the opposite direction, so that it is impossible to train an orchard into a beautiful appearance; aside from this it is noticed that orchards in such locations are by no means prolific, and the fruit is of poor quality, not unlike the form of the tree, rudely shaped and ill-balanced.

Sandy soils have sometimes been looked upon as favorable for the growth of fruit trees. The easy manner in which these soils are cultivated, and the rapidity with which some of the earlier crops come to maturity, have induced people to look upon these soils with favor; but reason as well as observation should teach every practical farmer that such soils are among the very worst for this purpose; for under the hot sun of July and August, the moisture is absorbed and the roots robbed of one of the elements necessary for growth and sustenance; hence, the tree soon begins to assume a sickly appearance, withers, droops, and finally dies, producing but little fruit while it lived, and that of poor quality. No experienced farmer would expect to see a fine grass field on soil of this class. Hence, a sufficient reason why they should not be chosen for the cultivation of orchards. A gravelly loam is much better, especially so if the loam has the preponderance; if the gravel is in excess, and this is a matter for the cultivator himself to decide, it will be for his interest to set this aside with the other.

In *alluvial soils*, or soils composed of vegetable matter, found upon the banks of rivers, washed down from the hills, trees make a rapid growth, but the fruit is said not to mature as well or to be so highly flavored as in soils more calcareous.

It may also be objectionable to put out orchards in such soils where the valleys are deep, as the late frosts of spring might destroy the fruit-buds, or the early frosts of autumn injure the fruit.

Soil of argillaceous formation and black surface soil are probably among the best for apples and pears; although the trees may not make so rapid growth, yet they are more hardy and the fruit of higher flavor.

It is said by some of our best orchardists that clay is almost indispensable for the growth of apples and pears; it is probably for want of this ingredient in the subsoil that the Baldwin does not mature before the fruit falls from the trees; therefore, in selecting fields for orchards, judgment should be exercised in relation to the subsoil as well as the surface. If the subsoil be of such character as to retain the water it should be underdrained before transplanting, for when water stands and becomes stagnant, as most certainly it will at the depth of twelve or fifteen inches, thus far will roots extend, but they refuse to go farther. At this stage the tree assumes a sickly appearance. Now if drains be cut to the depth of thirty or thirty-six inches, the water will be removed to that depth, thus opening passages in the soil for the roots to make their researches at pleasure, which again gives health and vigor to the tree. Draining soils that are impervious to water is in effect giving a new soil to the tree; for when once freed from constant pressure of stagnant water the soil becomes drier, sweeter, looser and more friable.

Preparation of Soil.—The year previous to transplanting, the field should be ploughed deep and well manured, and cultivated with some hoed crops; at the time the trees are "set out," the field should again be well ploughed and manured. In laying out and staking the grounds the rows should be at least two rods distant, and the trees in the rows the same; if placed at a less distance or only twenty-five feet, as has been done in many cases, in twenty years the branches will interlock and produce less fruit and of poorer quality, and finally prove an injury to the orchard.

The holes for transplanting should not be less than two feet deep and six feet in diameter, and filled with compost made from rich loam, decayed wood and leaves, and only a small quantity of barn manure. The object of making the holes extensive and filling with rich compost is to give a loose rich soil for the small roots to work in the first year or two. In planting out the trees, instead of making a hollow to place the roots *in*, construct a hillock to place them *upon*, and all mutilated roots should be cut off in a slanting direction on the under side before setting. Here again care should be taken in placing the roots in their natural order, and the fine compost sprinkled in and about the roots through fingers till the tree will stand of itself. It is well to be thus careful in setting trees, as the roots send out fibres in all directions through the soil for food.

Great mistakes are frequently made in selecting trees from the nursery; trees of poor quality are purchased for the reason that they are cheap, and the argument is used that they will do about as well in the end. Now it is more economical to make a journey of twenty miles and purchase the best trees in a good nursery, and pay thirty or even forty cents, than to have very indifferent ones brought to the field and given.

It would also pay the expense to make this journey and take charge in removing the trees and spend *hours* in the work, than have them taken up as they frequently are in as many *minutes*, with broken and mutilated trunks and roots. A large amount of good roots is of more consequence than fine-looking trunks and heads; and all trees should be set as soon as possible after being taken from the nursery, while their rootlets are yet soft and tender. If trees cannot be set out till the roots become dry and withered, some planters have recommended to bury trees, root and branch, for a day or two, till the buds become plump and the roots soft; and if the transplanting can be done in a cloudy or misty day, "all the better"; and above all, we should say to the young farmer or orchardist, beware of itinerant tree peddlers who are able to make a good display and talk of new varieties, and perhaps give their large experience as orchardists, when they never cared for or set out the first tree.

Mulching, says Mr. Barry, of Mount Hope nurseries, should be looked upon as an indispensable operation in all cases. It consists in laying on the surface of the ground around the trees, to the distance of three feet or so, a covering of half-decomposed manure, sawdust, spent tan bark, etc., two or three inches deep. This prevents the moisture from evaporating, and maintains a uniformity of heat which is highly favorable to the growth of new roots; it also prevents the growth of weeds around the trees, and obviates the necessity of hoeing, dressing or watering during the season; a deep mulching should always be given to fall planting to prevent the frost penetrating the roots or drawing up the tree.

Captain Pierce, of Arlington, says he would rather pay forty dollars a ton for meadow hay to mulch his trees than do without it.

I have practised mulching my trees for the past two years; I begin in March to throw out my meadow hay into the barn-yard; my young cattle feed as much or as little as they please; about the first of May the mulching is forked in heaps or ridges, and about the first of June it is applied to young trees. It works so well that I shall continue the operation. For trees of older growth or those in bearing, the hay may be applied at any time at the rate of a load to the acre. The operation secures a four-fold object: it prevents grass and weeds from growing, it keeps the ground moist in the dry part of the season, and in the end it makes manure; the fruit is not in the least injured by falling from the trees.

EPHRAIM GRAHAM, *Chairman.*

BERKSHIRE.

From the Report of the Committee.

In our report last year we took occasion to give our views of what constitutes a well managed farm, and we propose this year to speak of fruit, and especially of the apple as the leading fruit of New England. While we rejoice to see the increased attention given to grapes, and to bear testimony to the variety and excellence of the clusters of this most healthful fruit, which we have seen growing in Berkshire this summer, as also to the large and luscious pears, and more luscious peaches, still the apple will ever remain the staple fruit of this section. It can be raised in great abundance and in great perfection, and lasts from the beginning to the end of the year. It is good for the dessert and good for cooking. The acid of the apple is congenial to most stomachs, and is a great auxiliary in digestion, counteracting the bilious tendency which is so prevalent, especially in the latter part of summer and in the autumn, when the apple is in its most perfect condition. Could all men be supplied with an apple or two each day in the year, as they can be with a little painstaking, we are confident that there would be less dyspepsia in the community. Children are extravagently fond of apples, and the natural craving which they all have for the fruit proves that it is congenial to their natures, and that they should be indulged in the use of it. In cooking, certainly, there is no fruit which is so economical, and at the same time so satisfactory, as the apple. We tire of a berry pie, but for a dessert which is acceptable 365 days in the year, we commend the apple either in its raw state, or made into sauce, dumplings and pies.

There is no danger of the market being overstocked with this fruit, as some suppose. True, in a good fruit season the price may be comparatively low, but it is always remunerative, as the cost of raising is small. When the price is $2 per barrel, as it is this year, producers must console themselves with the reflection that multitudes of families can indulge in the purchase of a few barrels that would feel compelled to deny themselves were the price twice as great. Then, again, apples are worth much more than the cost of production, for feeding to stock. Hogs eat them with the same avidity as do the children, and, what is an exception to the common rule, seem to prefer them raw, and thrive better upon the raw fruit than when it is cooked. One of the best modes of feeding swine upon apples is to let them have the run of the orchard, as they will do their own harvesting, eating all the windfalls, which are generally wormy, thus preventing the worm from burrowing in the earth, and rising again the next summer in the perfect or insect state, to multiply their species. Cows are fond of apples, and if fed judiciously they greatly increase the flow of milk. Horses also love them, and we can see no reason why they should not be indulged occasionally with a dish of this fruit. Horses have the most artificial diet of any of our domestic animals, and are the most subject to disease. We are confident a few apples would not only give a pleasant variety to their food, which all animals like, but also remedy some of the ills to which our horses are now subject.

If there is a surplus of apples after the wants of the family and the stock are supplied, and if the market demand is considered not sufficiently remunerative for careful picking, they can be made into cider and subsequently into vinegar. Pure cider vinegar is always in great demand, and commands a high price. Much that is sold under this name never emanated from the cider mill. There is more cider vinegar sold in the United States than there is cider manufactured. It is said that in order to be sure of obtaining a cask of genuine port wine, it is necessary to go to the vineyard near Oporto, watch its manufacture and ride home outside of your cask, and the case is pretty much the same with cider vinegar. To be certain that you have the prime article, you must manufacture your own cider, or buy it of a dealer in whose honesty you can confide.

The law now allows the manufacture and sale of cider in Massachusetts, and we hope to see great improvements in the production of this article, which, if made and used properly, can become a source of health to the community and wealth to the farmers. Much of the cider formerly made in New England has been spoiled in the making. The apples have not been mature, or else half-rotten, and the juice expressed through musty straw has been put into still more musty casks. When apples are fit to eat, then and then only are they fit to be made into cider. As the apple ripens the starch is converted into sugar, and it is only when sugar abounds in the apple that good cider can be made. Of course when the putrefactive process has commenced in the fruit, it is only fit for the dunghill. Probably more cider has been spoiled from being put into old casks than from any other cause. These casks cannot be cleaned by a simple washing out with cold water. If they have formerly contained cider, a little of which was left, as is apt to be the case, to pass through the acetous fermentation into the putrefactive state, some seeds of putrefaction will remain in spite of all cleaning by water, which will speedily corrupt the new cider. Some fresh slacked lime or strong solution of potash we have found efficient in refreshing these old casks, but we feel more sure of good cider when we put it into barrels in which alcohol or whiskey has been kept.

We have taken much pains in New England, where grapes, it has been supposed, would not flourish, to make wine from currants, blackberries, pie-plant, etc., but we are satisfied that the true wine of New England is made from apples, and if the same care were taken in the manufacture of cider that is bestowed upon wine, the former would compare favorably with the latter. There are already some manufacturers of cider in the eastern part of this State who are reaping great profits from the production of a superior article, and we commend this subject to the careful consideration of the Berkshire farmers. It is a reputation for superiority which commands a market for any commodity. Dr. Fisher, of Fitchburg, has this autumn found a ready sale for his grapes at twenty cents per pound, when other producers were glad to obtain half this price.

The notion has prevailed more or less extensively, that New England could not compete with the West in the production of good apples. We are ready to acknowledge that the Western fruit looks larger and fairer than ours; but in flavor, Western apples are not equal to eastern, and they certainly do not make so good cider. We have admired the products of the Missouri and Kansas orchards. The apples are large, tender and free from worms, but we miss the delicious flavor which characterizes our comparatively inferior-looking fruit. The same observation has been made by those who have visited Utah and California, and the want of flavor in the Western apples is especially manifest in the cider made from them. By skilful cultivation we are confident fruit can be made to rival even in size the productions of California, and if to this be added superiority in flavor, there is no necessity for New England farmers to retire from competition with the West in orchard products. Our soil, by long cultivation, has become partially exhausted of inorganic elements, but these can be restored by drainage, so that the roots of our trees can penetrate deeper without encountering a cold, wet hard-pan, and by liberal top-dressings of lime, plaster, bone-dust, and especially wood-ashes. The latter contain all the inorganic elements which vegetation demands, and are therefore at the present prices the most economical and the most reliable of all the commercial fertilizers. The West has the advantage in having fewer insects injurious to fruits, but these are marching westward with the progress of empire, and we have the advantage of long acquaintance with our insect enemies and the means of counteracting their baneful effects.

We have thus briefly given some reasons for increased attention to apple culture in New England, and we hope our farmers will not neglect this profitable branch of agriculture. We may not be able to compete in the New York markets with our Western friends, but we can at least supply the wants of our families and the home demand.

ALEXANDER HYDE, *Chairman.*

VINEYARDS.

PLYMOUTH.

Statement of R. E. Packard.

The vineyard set by Mr. Otis contains four hundred and twenty-five Concord vines, twenty-five Delaware and six Hartford Prolifics. The Concords and Hartfords were two years old when set; the Delawares were raised in a hot-house the previous winter. The soil is a gravelly loam, nearly level; it had been mown six years without dressing, and was in a worn-out condition. In 1866 it was planted to potatoes, with a little superphospate in the hills, the crop paying for cultivation.

April, 1867, seven cords of stable manure were ploughed in seven inches deep, and the ground harrowed with a heavy harrow. The vines were set in May, the rows nine feet apart, and the vines six feet apart in the rows. The ground was kept clean by using the cultivator and hand-hoe. The Concords and Hartfords were trained with two horizontal arms, the Delawares with but one. All other shoots were pinched back, and all laterals, tendrils and fruit blossoms were cut off. In the fall, eight hundred and eighty-seven cedar posts, from four to six inches in diameter and eight feet long, costing eight cents a piece were bought, stripped of their bark and housed.

In the spring of 1868, two posts were set to each vine, two feet deep, with the exception of the Delawares, for which but one post was used, and the two arms were trained around them in serpentine form. The land was kept well loosened by cultivating and hoeing three times, but not very deep. Mr. Otis not being able to prune the vines in the fall, they were left until the spring of 1869, when, he having died in March, I proceeded to carry out his intentions as nearly as I was able to do without practical experience.

After the vines were well leaved out, I pruned them back to two eyes, and when the new shoots got about two feet long, I pinched them off, cutting off all laterals and tendrils. The vines, now four years old, were considered old enough to bear, but only two of the best bunches were allowed to remain on each shoot, and vines which were not strong and healthy were not allowed to bear any. As fast as the vines got to the top of the posts they were clipped off.

The crop of fruit in 1869 was about twelve hundred pounds. I selected the best for table use, wholesaling them for fifteen cents per pound, and retailing them for twenty cents; the others I sold for preserving at ten and twelve cents per pound. The cultivation was the same as in previous years. In the fall, I pruned back to three eyes, one of which I took off this spring, 1870.

The present season I have pursued the same method of training and cultivating, getting a crop of about three thousand pounds, wholesaling them from eight to ten cents per pound and retailing from twelve to fifteen cents, averaging nine cents.

The fruit has ripened from September 15th to October 5th. In 1869, there were two quite severe frosts before harvesting, but no injury was done to the crop, the vineyard being in an open field without protection. The long continued drought this season somewhat injured a small portion of the vines, the leaves becoming dry and the fruit failing to mature fully, although suitable for preserving. The grapes generally have been very nice, free from disease, worms or any other imperfection. In marketing the fruit, we have been careful so to handle them as not to bruise them or rub off the bloom. They keep much longer and sell more rapidly when so handled.

The Hartfords and Delawares I do not consider worth raising in an open vineyard. The Concords exceed my expectations, being sufficiently hardy to stand the winter without protection and producing a good marketable grape. If I were to set another vineyard I should put the vine nine feet apart in the rows, instead of six.

The land in 1866, cost $67; seven cords of manure at $12 = $84; spreading, ploughing and harrowing, $12.50; four hundred and fifty-six vines, $114.90; setting vines, $13; cultivating and hoeing in 1867, $6.30; posts and setting, $100; cultivating, hoeing and training, 1868, $12; do. in 1869, $25; do. in 1870, $25; interest and taxes, $75. Total, $535.70.

The amount of fruit in 1869 was about twelve hundred pounds, value, $150; in 1870, about three thousand pounds, value, $270. Total, $420. The estimate cash value of the vineyard, October 1st, 1870, is $1,000.

R. E. Packard.

Note by the Committee.—The late remarkably hot and dry summer has been generally considered very favorable for the grape crop. In view of this fact Mr. Packard may err in attributing to the drought the failure of some of his fruit to ripen fully. If anything relating to grape culture is settled beyond controversy, it is that grapes exposed to the sun, or growing upon vines denuded of foliage, do not ripen as perfectly as those more completely shaded. It is quite possible that his vines, trained to single upright posts, and pinched back and summer pruned severely, may have been in some cases so deficient in leaves as to prevent the proper elaboration of the juices of the plant, or that the direct rays of the sun acting upon the fruit itself, may have caused some chemical change of a nature to retard or wholly arrest the process of ripening.

Statement of the Messrs. Barnes.

Our vineyard, situated on the east side of Bedford Street, North Abington, contains one hundred rods of land and four hundred and twenty vines. The land slopes a little to the south-west, the soil being a sandy loam, which had been planted with corn and root crops the three years previous to 1867. It was ploughed to the usual depth for corn, early in April of that year, and cross-ploughed, then harrowed the first of May, and furrowed out ten feet apart for the rows, which run east and west. The vines are six feet apart in the rows, and trained to trellises formed of posts twelve feet apart, with two rails nailed to the posts horizontally, two and a half feet apart, the lower one being eighteen inches from the ground. On a part of them, laths were nailed perpendicularly, about one foot apart on the rails; on the rest telegraph wires were fastened to the posts between the rails.

The vines are trained on the double tier and arm and spur system, as described by Fuller. Our vines were purchased of a nursery agent in Boston, but were not received by us until three weeks after the time agreed upon, making it the last of May when they were set out, which, as we think, materially checked their growth for that and the subsequent season. Concord vines only were ordered, but when they had thrown out new buds and leaves we found about sixty of them were Dianas.

Two rows of potatoes, heavily manured, were planted in each space between the rows of vines, paying the cost of cultivating the whole piece, most of the work being done with the horse-hoe. The middle of November, the vines were pruned back to two or three strong buds.

In the spring of 1868, we found twenty of the Concords and one-half the Dianas dead, or making but a feeble growth, and they were replaced by Concords of our own raising. With us the Diana has proved a failure, being subject to mildew and winter-killing, while the fruit does not ripen evenly enough to be fit to sell. Before the vines started, the posts were set twelve feet apart with a stake between to which the growing vines were kept tied during the season. In November the vines were pruned to form the arms, and the rails nailed on for the trellis. In 1869, the stoutest vines were allowed to bear a few bunches each, in all about two hundred pounds. The great gale in September, injured the fruit and vines, lessening the crop for that year.

This year nearly all the vines threw out fruit-buds, and after the grapes had set, about one-third of them were taken off, mostly from the weaker vines. We have found that Concord vines, when allowed to bear all they will the first year or two, exhaust themselves and make the crop uncertain for a year or two after. Our aim has been to obtain increasing crops each year, by summer pruning, so as to get good canes for the next year's fruit. Notwithstanding the severe drought, the vines this season have made a splendid growth of strong, healthy, well-ripened canes, giving promise of a fine crop next year.

Expenses: 1867, 100 rods of land, at $80 per acre, $50; ploughing and harrowing, $6; 420 vines at 30 cents, $126; setting vines, four days, $8; pruning, $1. In 1868, 252 posts, at six cents, $15.12; setting posts, four days, $8; 230 rails, at six cents, $13.80; 1,000 laths, $3.50; nails, $2; wire, $4; making trellis, six days, $12; cultivation, $6; pruning, $2. In 1869, cultivation and training vines, $10; pruning, $4. In 1870, cultivation and training, $16; interest and taxes, $54.50. Total, $341.92.

Receipts, 1869, grapes sold, 200 pounds at twenty cents, $40. In 1870, grapes sold, 1,200 pounds at twelve and a half cents, average $150. Total, $190. Excess of expenses, $151.92.

Deducting the expenses the present year, $16, from the amount of sales, $150, we have an income of $134, which taken as a basis of valuation would warrant us, as we think, in estimating the present value of our vineyard at $1,000.

We would offer the following suggestions to those about planting vineyards. Obtain strong, healthy vines from responsible parties. Choose a warm and well drained soil, where there is a good circulation of air, which will tend to prevent mildew. The soil need not be rich ; our vines have had no manure except what was applied to other crops between the rows. Set the posts when you set the vines to prevent subsequent injury to the roots ; the trellises may be completed at any time afterwards. Be satisfied with moderate crops the first two or three years of bearing.

T. & J. BARNES.

FRUITS.

MIDDLESEX.

From the Report of the Committee.

GRAPES.—The last summer, as you are aware, was remarkable for dryness, for the brightness of the sun, and long continued heat,—just the conditions for maturing the grape to the highest degree of excellence, provided the vines were properly cared for, which leads us to state what we regard as suitable care under such circumstances. In the first place, however, it may not be amiss to say that, owing to the conditions alluded to, grapes ripened over a large extent of territory at nearly the same time, and the variation in the time for the different varieties maturing, was not so marked as in ordinary seasons ; hence the difficulty of judging as to comparative merits of many of the new sorts on the point of early maturity. The quality of each has not been surpassed by itself in any previous year within our recollection.

Now then, to the care and want of care to which we alluded, and which has been clearly observable ; on soils similar in character, indeed, the difference is so slight as not to be discernable, except in the mode of treatment.

Dry as the season was, those who gave clean cultivation to their vines, eradicating all noxious *weeds* (all weeds are such) early nipped them in the bud, and kept the soil frequently tilled and light on the surface, during the dry and hot weeks with which we were favored, secured a good growth of mature canes for next season's fruiting, together with a good crop of average-sized bunches and berries, and in many instances both were very large. On the other hand, those who gave one or two hoeings early in the season, leaving the weeds to grow, and the soil to bake and crack, affording additional facilities for evaporating the water contained therein, need not be surprised that their berries were small, neither should they if denied any crop next year, for vines that produce half-grown fruit are not in a condition to set fruit-buds for the next season. On that point our experience enables us, as we believe, to judge correctly.

These remarks are not only applicable to grape culture, but equally so to all crops for which the cultivator or hoe are put in requisition. If any one has doubts as to the damaging effects of neglecting to stir the surface, and destroying all the little pumps which are worthless, standing in the soil, let him try the experiment thoroughly, for once, on a small scale, on the weedy side, and he will be cured in theory at least, and we trust in practice, unless he is one of those unfortunates who frequently lay out more work than they find time to carry through. That disease has become chronic with some,—the losses which accrue in consequence producing no cure.

Does any one doubt that a weed is a pump? let him cut off one some sunny morning in July, watch the same twenty minutes, more or less, and see its head begin to droop—no source of supply, and evaporation continually going on, it must be obvious, that on an acre thickly covered with weeds, many barrels of water are daily drawn from the soil, which should be retained therein for a more useful purpose. Weeds not only exhaust the soil of moisture, but they are also gross feeders on the elements of fertility artificially applied, as is clearly evidenced in all cases where manure is applied. That is understood by intelligent cultivators everywhere; and being a Yankee, we venture to guess that if Secretary Moore should be asked, he will assert that if he neglected to stir the surface soil in his grapery frequently during the dry season, keeping the grounds clear of weeds. his yield of fruit would have been only about two-thirds of what he did secure.

We are also more fully convinced that a warm soil, say a sandy loam, is the most suitable for grapes, and we need not affirm at this late day that a southern slope, considerably elevated above the frosty hollows, is the best location, for that is already understood. No matter how much heat can be concentrated in the soil, and we were about to say that rain or *no* rain, if the soil has been prepared so that the roots will penetrate to the depth of twelve inches, and cultivated properly, a crop may be regarded as a sure thing. No plant, to our knowledge, will stand a pinching drought better than a grape-vine. We believe, too, that the most approved method in planting vines is to have the rows running north and south, giving each vine about sixty feet of land; rows ten feet apart, and plants six feet from each other in the row, varying a little as circumstances may require; that, in our judgment, is right for the strong-growing kinds, like the Concord, Hartford and others.

ASA CLEMENT, *Chairman.*

FRANKLIN.

From the Report of the Committee.

It may not be amiss to advise any one who contemplates starting in the fruit business, not to set out an orchard or vineyard on ground that has once been occupied recently by the same kind of stock he intends planting. I should fear to set young apple-trees on the site of an old orchard, from which worthless apple-trees had been taken, but I should not fear to let it succeed the pear or peach or grape, and I apprehend the same may be said of all other fruits; rotation may be as essential to that as to any other crop. May not our lack of attention to that, account in part for the unsatisfactory results in our pomology? I need not refer to the fact that nearly all the choicest fruits are obtained by grafting or budding, only to allude to the influence of the stock (if it has any). Is the stock a mere passive vehicle through which the sap is drawn by the leaves, having no influence in the elaboration of the fruit? If so it makes no difference what the stock may be. But I do not believe that to be the case.

I find that fruit grafted on strong, rapidly growing stock. entirely different from the scion, loses some of its original flavor; perhaps more concisely speaking, its flavor is *modified.* Now admitting this modification of the stock to be the law, may we not use it to advantage?

If, for instance, we wish to plant a thousand apple-trees, say Baldwins, if grafting must modify the flavor, may we not choose the modifying influence? Say graft first as many promiscuous trees as we wish to plant, with scions of any kind we may fancy as a *modifier*, and then in due time regraft with the kind wanted, then shall we not have a uniform modification and at the same time an advance in quality? Of course these remarks will apply alike to all kinds of grafted fruits. Speaking of grafting, how great has been the improvement in that method of propagation since the swingletow and clay have been superseded by the artistic and *sure* method by which the operation is performed. The fruits of our county are receiving, of late, a very valuable reinforcement in the grape. How very short is the time since hardly any one here knew anything about any other than our native fox grapes, except through "hearsay evidence." Now almost any choice, and many of the *choicest* varieties, are so plentiful that it is almost difficult to sell them.

This may be in part because the taste of the people has not become educated; but the amount is really abundant, so great in our county that much has been sent to considerable distance to find a market. No feature of our fair was more interesting than that presented by our grapes.

Our grapes are raised mostly in the towns of Greenfield, Shelburne, Sunderland, Deerfield, Montague and Leyden, all of which towns were well represented. I hope it may not be amiss to admonish fruit growers, especially growers of grapes, not to multiply kinds recklessly; better, after finding which are best, stick to them, than to fill up your ground with doubtful varieties.

Of what use is it to try to cultivate for profit in our climate, kinds that will not ripen before October? The Iona or Concord, both excellent when perfect, cannot be *relied* upon here. The same may be said of many other varieties presented at our fairs by amateurs. And purchasers of stock for setting should be on their guard, and not be cajoled by high-sounding names into buying such worthless rubbish.

And this suggests the idea that the practice of our society is *wrong* in offering premiums for the largest collections; it should be only for the *best specimens of the best varieties adapted to our climate.* I would not discourage propagators from experimenting for the purpose of bringing out better varieties, of course; I should recommend that a very high premium be offered for *any real improvement* upon our best kinds of grapes or any other fruit.

Every fruit grower should have some knowledge of entomology. He will find this knowledge a great help in distinguishing his friends from his enemies. A great deal of pains are often taken to kill an insect which, if suffered to live, would be worth a good many days' work. Let us look into the matter. We cannot become masters of our business without patient, persistent study, and unwearied perseverance. No labor can yield a more noble reward than that which we may devote to this pursuit, if we devote enough of it to perfect ourselves in our art. It is nothing less than the power to compel our common mother to set up and run the machinery and *find the stock* for converting the dust of the earth and the moisture of the air into the choicest and most delicate food for man.

D. MOWRY, *Chairman.*

PLYMOUTH.

From the Report of the Committee.

In this country too many of the most scientific pomologists are compelled to reside in cities, and have made discoveries, originated valuable varieties of fruit, and produced specimens of unsurpassed beauty, from patches of ground which we should consider hardly large enough for a child's garden.

Magnitude may be considered a test of respectability in some professions, but not in pomology. The cultivator who operates with science upon a limited scale, takes precedence over him who manages a magnificent plantation with less skill. It is hoped that the premiums offered for *best specimens*, may be monopolized hereafter by those who grow fruit on a small scale.

The Committee took the liberty of asking all the exhibitors, whose fruit presented unusual merit, their method of culture, and have to thank most of them for careful and elaborate replies, the substance of which we have endeavored to embody in this report.

Apples.—Within the past year statements have been made upon very high authority, that apple culture in Massachusetts was becoming uncertain and unprofitable, owing to the superiority of Western apples.

The Western orchards are all young, and young trees if properly cultivated, uniformly produce the handsomest fruit. Another advantage which the Western cultivator enjoys is the *absence* of old orchards. Probably there are more decaying and half dead apple trees in this county than in the two States of Indiana and Illinois.

These same old trees are more than "cumberers of the earth." They harbor and propagate all manner of evil insects, but have not sap enough to support them, and are therefore compelled to colonize them upon their more vigorous neighbors. This is one serious drawback upon Eastern culture, and we believe the subject of removing old orchards to be equal in importance to that of planting new.

A distinguishing feature in the Western tree, is its open top and smooth limbs, which are longer and straighter than ours. The buds are further apart and fruit-spurs are not so numerous. For this reason the tree is not over-loaded with fruit at the start, as our trees uniformly are in bearing years.

We think this is a valuable habit in the Western tree, and that it can be imitated in our own by proper pruning. If a limb of three inches in diameter is carefully sawn from a tree in any season, it will never heal *up*, though it may heal *over;* it will prove a permanent injury, and sooner or later will kill the tree. When a saw or an axe is used in an orchard, it should be applied close to the ground. A pocket knife is the only pruning instrument admissible, and the proper season for pruning is whenever a limb is seen out of place. The form of the tree, and position and number of the main limbs, can be determined when the tree is three years old; thin the boughs and twigs afterwards as required, and remove all limbs growing towards the centre as fast as they appear.

The bark should never be scraped or whitewashed, but kept constantly clean by some alkaline or saline solution. An excellent wash is the bitter or mother water, which is a refuse of salt works. Cultivate the trees in a style practised by a prominent exhibitor, whose language we use as better than our own, and there will be no more complaints made of the inferiority of Eastern apples: "My trees are planted on a rich, moist soil. I spread manure on the land and plough it in every spring. The apple crop requires manure as much as any other, and no other crop should be taken from the land."

The following list of apples is recommended by different exhibitors, as suitable for this county. The figures are not to be taken as an index of quality, but extent of acquaintance.:

Number 1, shows that the fruit is recommended by one or two, and is not widely known. Number 2, shows that half at least of the exhibitors are acquainted with, and recommend it, and Number 3, that most of them do so.

Those in italics are Plymouth County seedlings.

Red Astrachan, 3; Early Joe, 2; Sweet Bough, 2; *Manomet Sweeting*, 1; *Burrell's Sweet Russet*, 1; Porter, 3; Tower, 1, Spice Sweet, 2; High-top, 2; Yellow Pearmain, 1; Esopus Spitzenberg, 1; English Codline, 1; Tallman Sweet, 2; Roxbury Russet, 2; Golden Russet, 3; Greening, 3; Baldwin, 3; Burr's Winter Sweet, 2; Peck's Pleasant, 2; Hubbardston Nonesuch, 3; Jewell's Red, 1; King, 1; Lady's Sweeting, 1; Northern Spy, 1.

PEARS.—Without assuming to decide how many varieties to cultivate, or the proper stock to grow them upon, we will say that the grower who confines himself to six varieties will leave out of his list a great many good ones, and if he has no dwarf trees, there will be some even of his six that he will not taste in perfection.

An excellent manure for pears is home-made superphosphate.

GRAPES.—Probably the culture of the "vitis vinifera" or European grape was as well understood and practised two thousand years ago as at present; but it is settled we cannot grow this grape out of doors.

This fact was stated by Mr. Longworth, about twenty years ago; and about the same time he made the statement, as the result of his large experience, that our native grape could be improved and finally brought to perfection by continued cultivation and reproduction from seed. About the same time, or somewhat later, other cultivators attempted hybridizing our native grapes with the *vinifera*, in order to obtain a good fruit, adapted to our country, more rapidly than by the slow but certain process of Mr. Longworth. The result, so far as the fruit is concerned, is all that the advocates of the process expected, and we have hybrid grapes of finer quality than we could expect to make our native grape in a century of careful culture. There seems, however, to be a natural law by which a hybrid, which partakes in some degree of the characteristics of both parents, must also partake of the disabilities of both, and be subject to the diseases of both; and it is this that prevents in nature the long continuance of hybrid races. A hybrid cannot become a new species, but is merely a combination of old ones.

The statements of the exhibitors show that the hybrid grapes are uncertain. Some give the preference to one variety and some to another. It is also stated that varieties which did well last year, did poorly this, and *vice versa.*

All the grape growers with whom we have corresponded, have evinced their appreciation of an attempt to systematize their knowledge, and their disposition to impart it freely.

We advise a person about to plant grapes, and having a choice of situation, to select the south side of a gravel hill; having no hard-pan, but open to the level of the springs, and sheltered from east winds, and from all others, if possible. The soil on such hills is generally pretty uniform, and of no great consequence. Apply bone dust and ashes, but no excrementitious manures. Muck can be used. The training to trellis or stake is purely a question of convenience or fancy. No pruning is dangerous before January, but *excessive* pruning *may* be so in summer, according to the season. We further advise the planter to read up everything in late reports favorable to robins. Otherwise he may feel disposed to anathematize the bird when his grapes ripen; particularly if the plants be the Delaware and Rogers.

Varieties.—Concord.—For describing this we give the language of an exhibitor and fully endorse it: "It is the best grape to grow in New England, for those who like it."

Allen's Hybrid.—The best, the most difficult to grow and the most uncertain.

Rogers' Hybrids.—No. 4. The most hardy of either and the earliest, the best for the vineyard so far as tried.

No. 15. The highest flavor of either, the worst to set and the most subject to mildew.

No. 19. Handsomest bunches and sweetest.

Nos. 3, 22, 33. Not superior to those already mentioned, but good for variety.

Delaware.—First rate and pretty sure; tender in some places.

Iona.—First rate, but very uncertain.

Israella.—Not so good this year as last.

Eumelan.—First rate, and has done well so far as tried. Northern Muscadine; Hartford Prolific; Early Amber. Very sure and better than wild grapes.

Dracut Amber.—Early, good for those who like a strong grape.

Cottage, *Una.*—Have generally done well so far as tried.

Adirondack.—Good, very slow grower.

Perkins.—Better than last year.

Diana.—Good but uncertain. Only half hardy.

Isabella.—Will ripen regularly on south side of a building or fence if properly trained. Very uncertain elsewhere.

Catawba.—Has ripened this summer, the first time for twenty years.

Ives' Seedling.—Earlier than Concord; sure bearer and good.

Clinton.—Not good to eat, but best grape for jelly.

J. E. CARVER, *Chairman.*

HINGHAM.

From the Report of the Committee.

APPLES.—In the prevailing brilliancy of color and the fully ripened condition of the fruit, the apples on our tables at the recent fair have never been surpassed, if equalled.

Among the kinds that may be regarded as new, or that have hitherto been cultivated to a limited extent in this vicinity, the Committee were pleased to see a fine dish of the Washington. This apple is large, attractive in appearance, with a rich, subacid flavor, and succeeds the Gravenstein, which indeed it somewhat resembles. Its success in this locality the future must determine.

The Northern Spy from which so much was expected, we are sorry to say will probably prove a failure. The tree is productive, and the fruit is not only large and handsome, but of good quality. Its great defect is in its liability to premature decay—no inconsiderable portion of the crop being frequently found unsound even at the time of gathering. It is classed as in perfection in March and April, and we have occasionally seen the fruit at this season that in every point of excellence seemed to leave little to be desired ; but its perishable nature when grown in this vicinity renders it almost valueless.

The general perfection and beauty of the dishes of the Mother apple afforded the Committee much gratification. The tree is so productive, the fruit is so richly colored, so free from blemishes, and withal of so good quality for the table, that we consider it one of the best of the numerous kinds which came before us for examination, and it is recommended for cultivation.

In the dishes of the Cogswell exhibited, there were seen the same evenness in size, beauty of color and perfection of form which have been its almost unvarying characteristics for years past. The tree is productive to a fault ; the fruit is of good quality, makes a fine appearance when on the table, and is in condition for use from November to February. There is no apple known to us better adapted for cultivation in poor, gravelly soil than this. Its single defect appears to be in the liability of the tree to shed its fruit.

The Brewer apple, the dishes of which were so numerous and prominent, certainly has the merit of size, and its unfailing appearance at our yearly exhibitions is evidence that it also has the further merit of being an annual bearer. It is a good sort for cooking, but too coarse in texture to be classed as a table fruit, besides being liable to drop before it attains its full size. Where room is abundant, however, a tree of this kind may be desirable.

Your Committee believe the cultivation of the Hubbardston

Nonesuch might be profitably extended in this vicinity. The samples shown were all good, and some were strikingly large and handsome. As an eating apple it is almost unsurpassed, and no kind sells more readily, or commands a higher price in the market.

For "first early" apples, we believe the Red Astrachan and Sweet Bough to be the best. Intermediate in flavor, and ripening at nearly the same time, is the Primate, an apple much less generally known and cultivated than it deserves. In the delicacy of its flavor, and in the tender, almost melting character of its flesh, it is not excelled by any other fruit of its season. For a succession we recommend the Gravenstein, Porter, and, where one has the benefit of a deep, rich soil, the Williams' Favorite.

For winter use the Baldwin, Greening and Roxbury Russet continue the standard varieties. No trees are more hardy, and few, if any, return a greater average yield. Further than this, no kinds are better known, or more esteemed, both at home and abroad. They are good keepers, bear transportation well, and for shipping purposes stand at present unrivalled. Were we to set but a single tree, we should make our selection from these.

We are gratified to note the increasing demand for sweet apples. Plentiful and cheap as they now are, every family may share generously in the healthful luxury. Among the kinds most desirable will be found the Danvers' Winter Sweet, Tolman's Sweeting, Ladies' Sweeting, Lane Sweeting, Orange Sweeting, and others, though we regret to add that so few of these appeared among the dishes at the annual exhibition.

The season has been a peculiar one. Notwithstanding the almost entire absence of rain for twelve successive weeks, added to the ordinary liabilities to injury from frost, insects or disease, there appears to be no locality throughout the United States or the Canadas where the crop of apples is not only plentiful, but even superabundant. In the remarkable season of 1862, when the number of barrels raised in Hingham was estimated at ten thousand, there was not only a demand for export, but no inconsiderable portion of our surplus was required at home to meet the want created by the partial or total failure in various parts of the country. It is true that prices at the time were low, but purchasers were not wanting and sales were easy. In striking contrast with this state of things, we now find apples abundant *everywhere.* There is no lack at home, and there is no demand abroad. Trade is unaffected by a reduction in price, and sales drag heavily. There are literally apples for the million, and growers search our markets in vain for purchasers at one and two dollars the barrel. The cider-mills of the country, though in constant operation night and day, fail to meet the requirements of their customers; the supply of casks and packages is exhausted, and thousands of bushels are being daily fed to the cattle and swine of our farms as an economical substitute for hay and grain! What a lesson this for those who only a few years since pronounced orcharding a failure, declared the days of the apple-tree numbered, and advised young cultivators and farmers generally to abandon the growing of the fruit, and to cut down their trees as cumberers of the ground, fit only for fuel, and of poor quality even for that!

It has been remarked that for every ten years there are three years of plenty, and three years when the crop is nearly or quite a total failure, the remaining four years producing some fruit, amounting on the average to nearly half a crop; and this statement is drawn not from the results of a single decade, but from the statistics of the past one hundred and fifty years. Such a summing up of the matter may not be encouraging, yet could we be assured of like results we should plant an orchard. Frost, disease, the canker-worm and other insects will undoubtedly in the future, as they have done throughout the past, impair and perhaps destroy the fruits of our labors; still we believe the setting of an orchard, or even a single tree, will prove a source of satisfaction, if not of pecuniary profit.

The fluctuations in price during the past ten years may be worthy of notice. The lowest point was reached in the autumn of 1862, at which time the ruling rate was but one dollar per barrel. From this sum the grower was obliged to deduct twenty-five cents for the package, and thirty cents for the cost of picking, barrelling and transporting to market, leaving a net amount of forty-five cents per barrel, or four cents per peck for selected fruit of the rarest, as well as of the best standard varieties.

In 1855 the crop of apples was generally small, and throughout the East was almost an entire failure. In March and April of the spring following, this fruit—nearly all of which was received from the West—sold readily at ten dollars per barrel, and was retailed by our merchants and market-men generally at one dollar per peck. It will thus be seen that the grower, who in 1862 was a seller at forty-five cents per barrel, became in turn a purchaser, in 1866, at one dollar per peck—an advance of twenty-four hundred per cent.

The great superiority of the kinds of apples now in general cultivation over those of seventy-five or a hundred years ago, will be generally admitted. But with regard to the quantity now raised in Hingham, it may be a question whether we have made the progress many suppose. About the beginning of the present century some of our farms—that of the late Captain Ezra Whiton for instance—produced a hundred barrels of cider in a single season, an amount which we think, even in this year of remarkable abundance, few, if any, of our most extensive orchards will equal. We are aware of the general inferiority of the fruit of the time, and of the small percentage that was really marketable or suitable to be preserved for winter use; still we are inclined to believe that the number of bushels for each inhabitant was then nearly or quite equal to what it is at present.

While we are making gratifying progress in the production of new varieties, it must be confessed that we find it more and more difficult to grow them in perfection. There is no success, even with the apple, short of thorough cultivation, and to the hands of those who practise it are annually passed the prizes of our society. "The tree thrives best that has the frequent imprints of the owner's footsteps about it," and the man who plants an orchard, and leaves his trees a prey to disease, insects, grass and weeds, will seek for fruit and find none.

Fearing Burr, *Chairman.*

Pears.—The revolution in fruit culture has kept pace with other changes and improvements. In pear culture many new varieties have been introduced by artificial fertilization, by chance discovery as in the case of the Vicar of Winkfield and others, by working on Van Mons' theory, or by root-pruning and bud-nipping of seedlings, some of them of surpassing excellence, supplanting the most highly prized varieties of former times. With the introduction of superior varieties, tastes have become more critical and exacting. No one pear, unless it be the Seckel, is universally pronounced best; a kind that one person esteems the best, another may think lacking in aroma, or a little astringent; too sweet or too acid, too musky, dry or insipid. Much of the disagreement of tastes is probably caused by different modes of cultivation; for a pear double-worked on a good variety, whether it be on pear or quince, will much excel, in desirable qualities, one that is only single-worked on pear or quince. The number of contributions were three hundred and forty-eight plates, embracing about one hundred established varieties. There were twenty-five plates of Duchesse d'Angouleme; twenty-two Seckels; twenty-one Bartletts; sixteen Louise Bonne de Jersey; thirteen each Winter Nelis and Vicar of Winkfield; eleven Lawrence; ten Bicknell; nine Urbaniste; eight Beurre d'Anjou. This exhibit indicates the varieties that are most generally cultivated in this vicinity. There may be other varieties that will, in time not far distant, become favorites to the neglect of some of these.

The severe and long continued drought of summer, obviously tended to lessen the size of pears generally; but the Bicknell was an exception; it has rarely done better in regard to quality. The Vicar on the contrary suffered much, its average size being greatly inferior to what it has been in favorable seasons. The keeping quality of the Bartlett, judging from the unusual number of specimens offered, was improved by the dryness of the season, although its average size was below that of some former years.

The ripening of several varieties has been variously affected; the Winter Nelis and Vicar ripen in November instead of January and February; the Duchesse, a November pear, promises to be good for December.

The Mount Vernon, by Mrs. C. B. Leavitt, a native variety, said to possess desirable qualities, was not received in season to compete for premium.

Although less than one-eighth of the established varieties were offered for competition, enough were presented to demonstrate the fact that much interest is awakened on the subject of pear culture, and that there is a prevalent desire to be possessed of the very best varieties.

If to the leading varieties exhibited be added the Bloodgood, Dearborn's Seedling and Beurre Giffard, for summer varieties, the aggregate will constitute a number from which a good and reliable selection may be made. Whatever varieties one may prefer, it is well to bear in mind that the best pears, being more refined than the apple, cannot be successfully raised with the common attention bestowed on the cultivation of that fruit. Travelling agents are not always the most reliable persons; trees delivered by them are often of inferior quality, and untrue as to variety promised; therefore as a matter of economy and reliability in regard to the varieties sought, it is well to visit the nursery of a man of established reputation, and there to make selections, preferring those trees standing a proper distance from others, and such as made a vigorous growth the preceding season.

It is better to pay a round price for a good tree of the right form to be easily trained in pyramidal shape, which concurrent testimony establishes to be the best, than to accept as a free gift a tree of stunted growth and straggling form. When trees on the quince stock are sought for, it is proper to be assured that they were worked on the Angers, as those on the Orange or common quince stock are nearly worthless.

The ground having been liberally manured and thoroughly worked to the depth of eighteen inches or more the year previous, trees may be set in rows twelve feet apart and six feet apart in the rows,—those on pear stock the same depth that they previously stood; those on quince stock three or four inches, not more, before the union.

The space between the rows may be used for root crops; grain would be injurious. The ground should be kept free of weeds, and should annually receive a bountiful dressing of manure.

The depreciating tone in which dwarf trees are often spoken of, probably has its origin in the negligent manner in which they have been planted and cared for.

It has been said, and perhaps wisely, and from a conviction deeply impressed by sad experience, that he who goes to a nursery with the intention of buying pear-trees to be set out in the same manner, and to receive no more attention than apple-trees commonly do, had better pay the nurseryman his price and leave the trees with him.

The pear, whether on quince or seedling stock, is highly appreciative of generous treatment, and will not often fail to repay such treatment with a bountiful supply of fruit, provided that appropriate care is paid to training into due form, and that overbearing be effectually guarded against.

In regard to the best time for gathering, it appears to be generally conceded that summer pears should be taken from the tree as soon as they are judged to be sufficiently matured for the purpose, and ripened in the house in darkness and even temperature; and that winter pears should remain on the tree as long as they be exempt from injury by frost.

Every person who owns, or who rents for a few years a limited quantity of land, may soon realize an ample supply of excellent pears for his family, for nearly nine months of each year, by making a judicious selection of good dwarf trees, setting them in properly prepared soil, and giving them appropriate cultivation. It is a tree little injured by removal, and tenants when removing may take their trees with them, and reset and care for them in their new location.

This region is not the Eden of the pear-tree, like Holland and Belgium, or like California, where neither tree nor fruit is troubled by any bug, fire-blight, sun or rain; for here both tree and fruit are subject to injuries enough by blights and insects to require the careful attention of the intelligent culturist that the best success may be attained.

Would it not tend to promote the interests of pear culture for the Society to offer premiums for the best selection and most successful cultivation of trees, not less than twenty in number on the quince, and also on the pear stock?

Is it not important that competitors for premiums on pears should be required to make statements of their mode of cultivation, preparation of soil, selection of trees, and the varieties that succeed best with them, whether on the quince or on standard trees, etc.?

JAMES S. LEWIS, *Chairman.*

THE CANKER WORM.

ESSEX.

From the Report of the Committee.

The Committee on the Destruction of the Canker Worm respectfully report, that there has been but one entry for the Society's premium of $100 offered for a new, cheap and effectual protection against the ravages of that destroyer of the orchardist's hopes. It is presumed that the Society expects a better, cheaper and more effectual method of protection than is now known, in order to entile the claimant to the award.

That now offered by Mr. A. P. Noyes, of Middleton, is an arrangement of prepared hair cloth, invented by Mr. Charles P. Johnson.

Mr. Noyes applied this invention to some trees of one of the Committee, at an average cost of fifty cents per tree, in order to test its value as a protection against the grub of the canker worm. By putting a strip of tarred paper, with printers' ink upon it, above the hair cloth, it has been found that they passed through or over it and were caught by the ink, thereby proving the worthlessness of that invention.

The canker worm, that has been so destructive to the apple orchards of New England, has been closely observed, and its habits have been studied by your Committee and others, in order to protect themselves from its ravages. It has been noticed, that the grub commences breaking forth from its chrysalis form, after the first freeze, usually about the first of November. The females, which are wingless, proceed directly from the ground to the trunk of the tree, and commence their ascent. They continue coming from the ground, as the frost will permit, until April; generally in greater numbers in the spring than in the autumn. The males, which have wings, are more tardy in making their appearance; and the proportion of males (never so numerous as the females) is much greater in the spring. The female, having broken ground, ascends the tree more or less rapidly, according as the weather is mild; being benumbed and motionless in cold nights and days, but ready for a fresh start upward in a warm day. The males are more active in the darkest night even, than in the sunniest and warmest days, to flutter about the trunks and branches of the trees in search of the females, that are ready for pairing, having accomplished which, they pass on in search of others. The female very soon after impregnation deposits her eggs upon the branches of the tree in clusters of from twenty to a hundred or more, and then having obeyed the universal law of nature (equally applicable to animal and vegetable life) of providing for its reproduction, immediately dies. The eggs hatch just as the buds open and the tender leaves put forth ; and the minute worms, scarcely visible, proceed at once to feed upon them, making but little show until about the first of June, when, having attained half their growth, they become very voracious from the 15th to the 21st of June. Having attained their full size and stripped our apple and elm trees of every green leaf, they descend either by their webs or the trunks of the trees, and bury themselves in the ground from two to four inches deep, where they become transformed into chrysalids, there to remain until the coming frosts of November shall break their prison doors, when they appear in a new form as described above.

The object of the society in offering the liberal premium of one hundred dollars was doubtless to develop the most effectual, the most economical and simple protector to our orchards. From time to time many cumbersome and costly appliances (some patented and others not) have been offered to the public as certain remedies ; and large sums of money have been expended in their purchase, ending only in the disappointment and disgust of their purchasers. It is believed by your Committee that no plan of protection that has been devised is so good as that practised more than half a century ago, of tarring the trees ; the great difficulty attending which was the necessity of applying it so often.

A great improvement has been found in substituting printers' ink, which does not dry so readily. The best method of applying the ink is to take a strip of tarred paper, six or eight inches wide (a year old is best), and tack it around the body of the tree, after scraping off the roughest of the loose bark, and filling up any irregularities of the tree with cotton batting or tow. The paper should be put within one or two feet of the ground, to prevent cattle from rubbing off the ink and smearing themselves (as they will if they have the opportunity), and also to keep the female grubs as low down as possible; for they will often, when finding the obstruction of the ink, back down and after a time deposit their eggs below, even without impregnation. Instinct teaches the males to seek their mates higher up the tree in order to have the eggs deposited near where the young will find their food. The best quality of ink should be used, as it remains sticky longer than the cheaper preparations offered for that purpose, some of which are worthless.

The ink should be applied with a brush, near the top of the paper, so that it may not run down upon the bark of the tree, which causes injury to it by attracting an unnatural amount of heat from the sun. In some instances where the ink has been used without any paper, the tree has been killed. The paper should be removed from the tree after the season is over, as it makes a harbor for various other kinds of insects during the summer months.

It is contended by many that the eggs deposited in the autumn never hatch, and therefore it is useless to apply the ink until spring; but it is known that many, if not all such do hatch, and therefore, in order to have it effectual, it is necessary to commence in the fall and apply the ink as often as it dries upon the surface, varying according to the weather from three to ten days. It should also be applied just as the eggs hatch, for the purpose of catching any worms that may have hatched below the paper, although it is doubtful if the young worms would live so long without food as it would take them to ascend as far as the branches.

It has been found that if from any neglect of using the ink there are worms upon the trees about the first of June, by a sudden jar of the branches they will spin down, and immediately start for the trunk to ascend. A fresh application of the ink will then catch them.

Where an accurate account has been kept of the material used and labor performed, it has been found that the cost of protecting an orchard by this method is not over ten cents per tree, which is so small an expense that no one can make it an excuse for allowing his orchard to be destroyed, or even a single crop of apples.

Fall ploughing has been practised as a protection against the canker worm by some of the Committee for several years with perfect success, discovered accidentally by noticing that a part of an orchard, which was ploughed in the fall, entirely escaped the effects of the worm, while the portion of it not ploughed was eaten bare. All will admit the importance of ploughing and carefully cultivating an orchard, and if by doing it in the autumn the orchard will be protected from the canker worm, double incentive is offered for this system of cultivation.

The Committee feel warranted from their own experience and observation in recommending, as an effectual, cheap and simple protection against the canker worm, fall ploughing where practicable, and the use of tarred paper and printers' ink where ploughing is not admissible.

Benj. P. Ware, *Chairman.*

CRANBERRY MEADOWS.

MARSHFIELD.

From the Report of the Committee.

It has been customary with the writer of this report to redeem a small part of his bog swamp yearly ; and by this means he has brought into good cultivation about six acres of the swamp, which have well remunerated him for his labor. The sight of each year's progress has stimulated him, from year to year, to bring into cultivation about one-fourth of an acre each year.

It has taken him about twenty-four years to bring the six acres into a bearing state, and take care of the remainder of his farm. Persons who have plenty of money at their command could make the same improvement in one year ; and it might be advisable to do so.

Farmers with small means can make great improvements by persevering industry, and not run much risk.

Let us mention the locations, and point out the situations which are most favorable to the full development of the berry. In selecting a place for a patch, it is well to consider its aspect. Though we have seen the vine doing well, and to all appearances very thrifty, when the yard has faced the north, yet experience is in favor of a southerly direction.

If possible, in forming a patch, let it be sheltered from the cold, raw winds; give it the advantage of the warm breezes; by doing this you will be more likely to succeed than if you neglected it.

A swamp may be chosen. If you find the vine growing around the edges of a bog, you may safely conclude that the plant can there be advantageously cultivated. In the preparation of these locations, there is often much labor and some expense; but this depends upon the surface, and what there is to be done in removing the turf and "filling in."

If you make a cranberry patch in a swamp, and it is liable to have water standing in pools over the vines in the summer season, this will operate as a hindrance to the ripening of the berry. This precaution must be observed in making choice of such a situation, that the water can be drawn off when it is necessary.

Meadow land which is low and moist affords an excellent location for the cranberry. In fact, these damp situations are very suitable, provided the dampness or moisture is not too cold and icy. If the moisture beneath the surface in which the vine is planted is of too cold a temperature, it will prove fatal to the young vines. Care must be had, in selecting for a yard, to ascertain if the water is too cold; if it is not, it may be converted into a useful and profitable cranberry patch. There *must* be water in the land in which they are planted; as a general rule, it is best to have it within eight inches of the surface. The object of this is to give moisture. The grower must have it, or his plants will fail.

A gradual slope is often to be met with, coming down to the edge of a pond. When such inclines are properly prepared and planted, they make the best of yards; and such locations generally have a soil in which the vine will do excellently, and there is not so much trouble with them, as the gravel chokes the weeds.

Sandy patches of land or plats, that are near the seashore, which are not liable to be overflowed with salt water, stand high.

In planting vines, dead levels by the side of ponds should be guarded against. The land should conform to the land behind it, sloping from the hill to the edge of the pond. The reason for this is, that if it is not done, water from the hills will cause the land to be springy and spongy, and that it will make stagnant water, which generates a green, slimy moss, which is an enemy to the cranberry vine.

Dead sand, water and air are the elements upon which the cranberry feeds best, and attains its highest degree of perfection ; therefore, that soil and location which has these advantages is best adapted for the growth of the berry.

Peat is found to be excellent, in fact next in value and importance to beach sand, for the growth of the cranberry ; but it wants management and care in its preparation, in order to be made useful to the vine. In selecting a peat swamp to be converted into a cranberry patch, it is necessary to take off the top turf or grass, and if possible give the yard a little incline. When this is done, it is unsafe to plant at once ; if you do so, you will find that the peat will cake and crack. It will be hard on the surface, and a few inches below stiff and dry. The most inexperienced in cranberry cultivation knows that such a condition is bad for the vine.

To obviate the difficulty, prepare the surface as is stated above, and leave the yard exposed to the frost and weather for one year. When the frost is thawed out of it, it will crumble and be powdery. It will never cake afterwards. It will be light and porous, and you may then with safety plant your vines, and with moderate attention they will do well.

Israel H. Sherman, *Chairman.*

INDIAN CORN.

ESSEX.

Statement of J. C. and R. Jaques.

The crop of Indian corn which we have entered for premium grew upon one acre of land. The soil is a light loam and was ploughed for this crop the first time for seven years. It was ploughed in the fall, and again in the spring, about eight inches in depth. Nine cords of manure were used, five of which were ploughed in and four harrowed in; the land was marked off in rows, three and one-half feet each way, and planted on the tenth day of May; cultivated with a common cultivator each way twice and hoed twice. The top stalks were cut August 27, and on September 27 we commenced to cut up and harvest, finishing the 1st of Oct. The amount of corn raised was one hundred bushels, eighty pounds to the bushel and eight pounds over; top stalks, two tons; butt stalks, five tons.

It should be remarked that upon eight rows, one hundred hills in length, fifty pounds of Bradley's Superphosphate were used in the hill; the same number of rows and hills were left without any special manure, and ashes were used upon six rows, one hundred hills in length. The crop upon the eight rows where the superphosphate was used yielded one hundred and eighty pounds more than the eight rows where no special manure was used. Upon the six rows where wood ashes was used, the yield was one hundred pounds more than upon the same number of hills where no extra manure was used. One half pint of ashes was used in the hill. The land upon which this experiment was made was selected with special care, that it should be as nearly alike in character and situation as possible.

The corn was quite dry, so that it shelled from the cob in harvesting and husking. One bushel of eighty pounds was shelled and ground the 17th of October; the shelled corn weighed sixty-four pounds; and the miller who ground it—a man of mature judgment—was of the opinion that it would not shrink more than two pounds, so that the value of the crop is actually more than given in the account.

Expense of Crop.

Cost of ploughing,	$9 00
Value of manure on the ground,	80 00
Cost of seed and planting,	3 50
Cost of cultivation,	8 00
Cost of harvesting and storing,	12 00
Cost of superphosphate and ashes,	2 66
	$115 16

Value of Crop.

One hundred bushels of corn,	$110 00
Two tons top stalks,	30 00
Five tons butt stalks,	30 00
Manure in land for future crops,	41 33
	$211 33
Deduct expense,	115 16
Net income,	$96 17

From actual measurement I hereby certify that the above crop covered one acre of land and no more.

Michael W. Bartlett, *Surveyor.*

MIDDLESEX SOUTH.

Statement of S. B. Bird.

The field of corn which I enter for premium contains two acres; the soil is a deep sandy loam on a gravelly subsoil. The field has been mowed seven years, and last year produced less than one ton per acre.

The piece was ploughed between the 18th and 25th of May, seven inches deep.

The manure from the barn cellar, composed of the droppings of the cattle mixed with peat mud and loam, carted to the cellar last autumn, was immediately carted on to the piece and thoroughly harrowed in with a Bucklin harrow; the field was marked three feet six inches apart each way, and the corn planted the 27th of May.

Cultivated and hoed three times, and kept entirely clear of weeds.

Commenced cutting stalks the 18th of August, and continued cutting for nearly a month, as I fed them to my cows directly from the field. Commenced harvesting October 5th.

Expenses.

Ploughing,	$12 00
Carting manure,	15 00
Spreading manure,	4 00
Harrowing,	6 00

Bushing and striking out,	$4 00
Planting and putting up lines,	4 00
Half bushel seed corn,	75
First cultivating and hoeing,	8 75
Second cultivating,	1 75
Third cultivating and hoeing,	7 50
Cutting stalks,	4 00
Harvesting and husking,	20 00
Twenty-one cords manure, at $6, one-half this year,	63 00
Interest and taxes,	14 20
	$164 95

The yield was 238 baskets of ears, weighing 40½ pounds each, making 135 bushels of 72 pounds each (72 pounds ears making 60 pounds shelled corn).

One hundred and thirty-five bushels corn, at $1.25,	$168 75
Four hundred bundles stalks, at three cents,	12 00
Husks,	30 00
Income,	$210 75
Expenses,	164 95
Profit,	$45 80

By the above account I find my corn has cost me, in the granary, 91 cents per bushel of 72 pounds, and if it is worth one dollar and twenty-five cents, as I believe it is, it certainly leaves a good margin for profit. There may be more profitable crops, but I think there are none which more readily bring the golden coin than the rich yellow golden corn.

S. B. BIRD.

VEGETABLES.

ESSEX.

From the Report of the Committee.

Your Committee are pleased to be able to report that the display in the vegetable department this season was in some respects an improvement on that of last year. The new requirements were responded to in several products, and we trust that as they become more and more known they will recommend themselves to the intelligence of the farmers of Essex, and the result will be to gather to our annual fairs higher standards of excellence in vegetables. This change cannot be brought about immediately, but where such good farmers as Alley of Marblehead, and Merrill of Danvers, lead, others in time will be sure to follow.

I would recommend that hereafter the premiums for Hubbard squashes be limited to those weighing from eight to twelve pounds. Our exhibition of this season gave us some fine specimens, with the exception that the size of many of them was too great. We all know how destructive to both quality and purity is the tendency to select the largest specimens in the squash family for stock seed. With the Hubbard it will result in the loss of the shell, a coarseness of fibre, and will ultimately destroy those characteristics which give it the greatest value for table use. We have lost the ancient excellences of the Marrow, in all probability, by this unhealthy course of sacrificing everything most desirable to mere size; let us fight a good fight for the Hubbard in its best estate.

In my report of last year I presented some of the best kinds of several varieties of vegetables. To "know beans" is proverbially a measure of wisdom; yet the knowledge of the agricultural public of this vegetable, which demands its place in every garden, is not always exhaustive.

In addition to the old classification into bush and pole, we have the intermediate varieties. These are more productive than the common bush, require about three feet between the rows, where they will develop well at two and a half feet apart, and yet are not of so running a habit as to need poles. The

Intermediate Horticultural is one of the best of the intermediates for family use. Grown on poor soil they almost lose their half-running habit, but when grown side by side on rich land with the common bush, their distinctive peculiarities are always developed.

The great improvement in beans for use in a green state as "snap" beans has been made by the introduction of the wax varieties. A wax bean may be defined as a variety in which the inner membrane is absent. It is this inner membrane that makes the pod stringy and so worthless to the housewife as a snap bean as it advances towards maturity, and when mature it is this same membrane that gives the dry pod a definite shape. Of the pole varieties of the wax bean, the Indian Chief, sometimes erroneously called Butter Bean, is the oldest and best known—the bean is black; the Giant wax has a longer and broader pod and the bean is of a bright red color; the Black Algerian has the longest and broadest pod of all, which is of a somewhat purple color; the bean is black. The pods of both the Indian Chief and Giant wax are of the usual green color when they first develope, but turn of a very light waxy color and become translucent as they grow older, these and the Black Algerian remaining good snap beans until the pods begin to dry. There are three varieties of dwarf wax beans, only one of which is as yet to any extent known; this is the Black Dwarf. The bean of a new sort that has recently been brought to my notice, resembles very much the Early China in color, and has the good characteristic of being thus far very pure. The Black Dwarf is much mixed up with the common bean, and I find that all of the wax family require to be cultivated with exceeding care, with special reference to isolation, to keep them pure. There is a white dwarf wax that promises to be quite an acquisition, the pods being equally tender with the pole varieties, the other bush sorts being somewhat inferior in this respect.

Of the common bush beans I have found none equal either in earliness or hardiness to the Fegee, which I would recommend as a string bean, the pods not filling out as well as most kinds. For a bean that combines earliness with good qualities, both as a snap and shell bean, I know none superior to the Dun Cranberry. The Early Valentine is a very round podded, pulpy bean, excellent as a string bean, but better known in the Middle States than in the North.

The past season has been remarkably favorable for the maturing of the large Lima, which with its fellow, the small Lima or Sieva, and known in some sections as Frost bean, is *the* bean for cooking; shelled in a green state. In ordinary seasons the Sieva can be successfully raised in warm locations as far north as latitude 43 or 44.

These and all beans that are somewhat tender in their habits take better to strings than to poles, and where poles are used let them be of as small diameter as can be consistent with the necessary strength. Of the early pole varieties, among the most desirable we have the London Horticultural, the Concord, one or two varieties of the pole Cranberry, and the Mottled Cranberry, which surpasses the common sorts in productiveness.

The climate of England does not supply the intense heat necessary for the development of our beans, hence they are hardly known to English housewives. The beans of England differ remarkably from ours, are very much alike, differing mostly in size of the bean and the color of blossom. They make a tall, stiff, straight stalk, with few or no laterals. While our beans are very sensitive to cold and crave the warmest locations, those of our English cousins will stand slight frosts with impunity and thrive in the coldest locations. For this reason they rarely do well in this country, and if they are planted it should be as soon as the frost is out of the ground, and in a cool location. In England the bean is raised by the acre to feed to stock, whence comes the name "Horse bean" for one of the varieties, and when fully grown, with their thick skin and rank flavor, they are no delicacy; but I have eaten them gathered when young, before the large eye is at all prominent, when they were as delicate and rich as the finest Lima.

Our English cousins know nothing of that delicious delicacy which is found on every table when corn is in the milk. One of their number who chanced to be travelling in this country during the season of green corn, returned to his countrymen in raptures over the new found dish, and, planning a surprise for his epicurean friends, he ordered sundry dozen of green ears from America by steamer. On their arrival they were set before his friends at a great banquet as the dish of the occasion.

His extravagant praise had raised a fever of expectation, and how it was satisfied in corn in the milk that had been picked a fortnight before it was cooked, and meanwhile enjoyed an ocean voyage, any Yankee can guess. It is said that as wry faces went the rounds of the table with the first bite, the host declared on his honor that green corn cooked in America tasted vastly different from what it was when cooked in England. Some of our city friends know of green corn as a luxury only as a reminiscence of their childhood.

Of the early varieties of sweet corn the Extra Early Dwarf is as early as any known to me. The ears are small, which is true of most of the earliest vegetables of their kind. The stalks are also small, so that the drills can be planted from two to two and a half feet apart. The Earl Narragansett is within a few days as early, and has the merit of making larger ears, while the kernels are remarkably large. The Forty Days corn is a white flint variety, but earlier than any of the sweet sorts, while it is tender and sweet the few days it remains in the milk. Its extreme earliness gives it value as a field corn in northern latitudes. The small early varieties of field corn are not sufficiently appreciated. If their habits of growth are fully studied, so that the proper distance apart and between the drills is learned, it will be found that most of them will give as great a crop by the acre as the most prolific large sorts, while the great merit of earliness is all on their side. I have known one of these small varieties yield one hundred bushels of shelled corn to the acre; yet if planted at the same distance as the ordinary sorts, probably the yield would have been little over half that quantity. In a country having so great a variety of soil and climate as ours, the early small sorts of field corn are not fully appreciated. In seasons when the cold, wet springs bring planting into June, they are safe, and in seasons or sections where frosts close vegetable growth by the middle of September, they are safe from harm.

The drill system is the system for high cultivation and large crops, not only with corn, but with potatoes. By no other mode of cultivation can each stalk have its equal proportion of the soil. There are two difficulties in the way of carrying out the drill system; I am unable to find in any of the agricultural stores of Boston any machine that will drop corn in the drill; the small seed drills worked by hand are of no value except on ground exceptionally light and well pulverized. On ground to any degree heavy too much strength is required to get the requisite depth, and when this is attained, the earth, being somewhat coarse, is pushed forward by the covering apparatus. Another practical difficulty is that of having the stalks thinned out to the right distance. In one sense this could easily be done, but I find that in actual practice it is apt to be delayed so late that injury is done to the crop, and at times overlooked altogether.

Some years ago I cultivated a variety of corn procured from the Sioux Indians, that surpassed all other kinds in earliness. It was of the starch class; the ears were very small and thick; it must have been grown in a high northern latitude, probably at the extreme limit of the corn crop. When our most northern sections are tilled, this variety will have a commercial value. Of the varieties of sweet corn following the extreme early sorts, Crosby's Early, originated by that sterling market gardener, Josiah Crosby, of Arlington, gives good satisfaction. It is from ten to fourteen rowed, the ears of good size and filled out on the end with remarkable uniformity; in quality it is sweet and tender. Crosby's corn has largely replaced that old standard eight-rowed sort, Darling's Early, which always had the demerit of not being reliable for filling out on the end. Of the later varieties, Stowell's Evergreen is the most extensively cultivated; this has some excellent characteristics; the ears are of a very large size, very well filled out, and the kernels are of the horse-tooth shape, giving them great length; in quality it is very sweet, while it remains a long while in the milk. The color of this variety, when gathered just past the milk, and dried for seed purposes, is of a remarkably rich tint. The Marblehead Mammoth Sweet is an improvement in size on Burr's Sweet, being in this respect at the head of the sweet corn group. It is late in maturing and of excellent quality. I have had single ears green in the husk that weighed three pounds. As this variety grows very stout, and succeeds remarkably, it is of great value for green fodder. Olcott's and Trimble's sweet corn with me are rather poor croppers, and the ears are of small size; the quality of seed of these is very good, but I cannot rank them with Mexican Sweet, which I have raised for a dozen years or more, and prefer to all others in sweetness and tenderness. The Mexican is medium early, ears of medium size, growing quite near the ground, usually two on a stalk. The color is dark purple when dried, but nearly white when in the milk.

Our Southern friends, and many in the West, prefer the field varieties when in the milk to our sweet corn, and I have reason to believe that their field corn when in the milk is somewhat sweeter than ours in the same condition. There are several varieties of what are called Joint-corn being introduced, kinds made by crossing standard sorts on the Egyptian, in which several ears grow on each stalk. As far as I have tried and examined them they hold out some promise, but the ears are of rather a smaller size than the same kinds growing naturally.

JAMES J. H. GREGORY, *Chairman.*

ESSEX.

Statement of William R. Putnam.

CABBAGES.—The land had been pastured for several years previous to 1869; it was ploughed in June, of 1869, and part planted with corn, for fodder, and part sown with *ruta-baga* turnips; manured with a compost of muck and bones.

In May, 1870, the land was ploughed and harrowed; the 7th of June, part of the piece was marked out in rows, three and a half feet apart; manured with a compost of barn-cellar manure mixed with muck—one and a half cords of clear manure mixed with two and a half cords of muck. The four cords were put on the upper half acre; this was put in the drills and covered with the plough; the ridges were levelled and the seed dropped about two and a half feet apart; the upper nine rows were planted with the Savoys, using the *American improved* seed, from J. J. H. Gregory; seven rows with the Mason Drumhead.

I notice that the rules of the society require the "value of the manure upon the ground." I estimate my clear manure at $15 per cord. My barn-cellar bottom is tight, so that all the urine is in the manure. The muck I estimate at $4 per cord,

after it is dried, making	$22.50	
Muck, ...	10 00	
		$32 50

Ploughing and harrowing, ...	$2 00
Carting on the manure, ...	3 00
Seed, 2 ounces, 75 cents each, ...	1 50
Planting, ...	4 00
Cultivating and hoeing three times, ...	8 00
	$51 00
There were one thousand six hundred cabbages upon the half acre, fifteen hundred marketable ones, the Savoys averaging six lbs. per head, and the others nine lbs. each. They have been sold at the average price of 13 cents each, ...	195 00
Profit, ...	$144 00

I estimate the leaves worth, for feeding milch cows, enough to pay for harvesting and marketing.

It was remarked by one of the Committee, when viewing the cabbage, that if I had planted nearer, I should probably have got a larger crop. My aim is to get the largest return for my manure and labor, and prepare the land for a hay crop; and I think when my crops are planted a greater distance apart and well cultivated, that they are not so much injured by the dry weather. If I was nearer the cities, where land is more valuable, it might be an object to try and get the largest return per acre.

MIDDLESEX.

From the Report of the Committee.

We observed that the best and purest specimens were those exhibited by men who grow them for the market. Being in that business ourselves, we know that it is not manure or cultivation alone that makes good vegetables; although without them there could not be any great success, neither with them can there be much success without good and *pure seed* of the right kind.

Now pure seed is not by any means an easy thing to purchase. Perhaps almost the only way to get it is to do as these men who exhibit these fine vegetables do—grow them yourselves. To do that, the roots or plants must be selected for seed with the utmost care, and should be perfect in form, color, quality and time of maturing; and when planted out for seed, they should be at a sufficient distance from any other variety of the same species as would prevent mixture or crossing. If there is any particular quality you desire to perpetuate or improve, then you must select with direct reference to that point; for instance, if you have a variety of pease which you desire to increase in size, you will select the largest pods; if to make them earlier, then select the first that ripens; plant them; select the earliest again; this you may have to do quite a number of times to reach your standard of perfection, which should be high.

This careful selection is necessary in growing all kinds of seeds, and the grower of seed should remember that all sorts of garden vegetables have, by a long course of cultivation and reproduction from the seed, been changed, and the condition of most of our vegetables is to a large extent artificial; and being in this condition, their tendency is to return to the wild state; and therefore to counteract that tendency will require care and selection on our part. We have sometimes thought that some of the seeds desired by farmers might be grown at the Agricultural College farm, and made a source of revenue to them, and a benefit to the farming community. We think that it could be done quite profitably if the proper skill and knowledge could be brought into requisition; and we will conclude by saying, that those who desire a full success cannot be too careful in procuring or growing their seeds.

George Hill, *Chairman.*

MIDDLESEX NORTH.

From the Report of the Committee.

Beets.—Select a sandy loam, not too light, as nearly level as possible; spread, as soon as the ground is fit to plough, finely worked stable manure at the rate of ten cords per acre; plough this in as deeply as may be without disturbing the subsoil, and let the land lie a day to dry; spread on the furrows about five cords per acre of night soil and muck compost, and plough crosswise. This second ploughing pays admirably; the most thorough disintegration of the soil is most important. In laying out manure for seed beds, my practice is to spread directly from the wagon ; an even distribution of manure gives a more uniform heat throughout the soil, consequently a more uniform crop. Go over the land thoroughly with the cultivator tooth harrow, then brush, and if necessary, hand rake.

Your bed is now ready for seed, in the selection of which there should be no guess work. Stick lightly in the ground three or four stakes (laths are good), in exact line for your first row ; if you have a machine that will sow beet seed well (I never saw one), place the wheel at the first stake, gauge eighteen inches for distance between rows, and go ahead, keeping the laths in line ; if you are a temperance man your row will be straight. I think the roller hastens vegetation, especially in loose soils ; many seeds lie loosely in the ground immediately after sowing, and some time is required for the earth to settle sufficiently close about them for germination ; the roller does this immediately (at once). Use the hoe as soon as the plants show themselves, weeds or no weeds, and thin out early rather than wait to market greens—the difference in labor and rapidity of growth will pay far better. In harvesting, pack in barrels or bin with dry sand ; this is no notion ; in no other way that I know of can you take out your vegetables in April and May, with their flavor and consistency perfectly preserved.

The above is with reference to an early market ; for winter use sow seed about May 20th.

Potatoes.—So much has been said and written upon potato culture lately, that I am happy to be able to say, little can be added ; speculation for once has taken the right direction. Three years ago, when Goodrich's seedling was the *ne plus ultra*, I made fifteen hills of a single potato, and raised somewhere about a bushel. The following year, I spread eight cords of stable manure upon one and one-half acres of pasture land, ploughed, furrowed, added one-half shovelful to the hill, with a handful of plaster, and planted single eyes of this variety as carefully as I could cut them ; from fifty-five square rods the receipts were one hundred and nineteen dollars ($119).

This current year I tried the Early Rose similarly, with this additional experiment : I cut off and planted one row of the seed end ; it was behind throughout the season and at harvesting. To sum up, therefore, spread two-thirds of your manure on sod land, plough and add the balance with plaster to the hill, plant single eyes, discarding seed end if you please, and after digging, bin up in dry sand. Last year I put up two hundred bushels in this manner, and they came out as hard and sound as when first stored. In case of occasional decay, the sand, absorbing the moisture, encrusts the potato and prevents spreading.

SQUASHES.—My mode of cultivation is to select a piece of deep soil about the third year from grass; plough in about four cords per acre of stable manure, harrow thoroughly, run furrows six feet apart, and put two shovelfuls of stable manure, night soil and muck compost in the hill; printed directions from most seedsmen give eight or ten feet space between the hills; I prefer to concentrate a little, and thin out to a single plant. Squashes will pay for almost any amount of manure, and single plants six feet apart each way actually require the amount stated.

I make it a point to lime as soon as the plants are up; the striped and black bugs dispute possession, and unless you are ahead they will be; to dose the former, put a handle into the nose of an old-style tin coffee-pot, perforate the bottom with fine holes, and fill with air-slacked lime; two quarts will dust one-fourth of an acre, and fast as you can walk; use this often while the dew is on, and after rains; the black bug will crawl under shingles at night and can be disposed of in the morning.

Another pest has taken hold of squashes and other vines within a few years, making it rather hazardous to thin, very early, to single plants; the vine suddenly withers and dies even after having run several yards; I have held many an inquest over those doomed vines, but the verdict has always been "Cause unknown"; no sign of disease can be detected in root or branch, nor can farmers, that I have ever heard, advance with confidence any theory regarding it.

In harvesting squashes do not wait until the day preceding frost; gather earlier, before they are over-chilled, and house, if possible, without placing one upon another.

CABBAGES.—Fifteen or twenty years ago it was comparatively fun to raise cabbages; to-day the little destructives whose name is legion, have made a successful crop, other things being equal, almost accidental. First comes the little flea, which commences on the just developed leaves and often finishes them ; next the maggot, which loves the roots. After transplanting, the cut-worm presents his claim, generally no modest one ; he makes clean work, cutting the plant completely off, either at or just below the surface. If you have successfully avoided this little army of marauders your crop is still open to the attacks of lice and the club-foot.

In raising plants for resetting, I select an elevated, comparatively new, and but moderately rich piece of ground ; elevated because the flea is less destructive than on low grounds ; nearly new, to avoid stump foot and maggot, and not over rich that the plants may be toughened by a slow growth ; upon resetting into a richer soil they will commence a rapid, vigorous development.

As soon as the twin-leaves show themselves they should be dusted with lime every morning and after rains. To secure plants from a few choice seeds, make a square frame with sides six inches high, and cover with mosquito cloth. I prefer transplanting rather than sowing seed in the hill, because then, if you lose your plants, it is generally too late to sow again, and you are obliged to use whatever plants may happen to come to hand.

It is the habit with many farmers to set plants on a fresh upturned sod ; it seems to me the better way to plant potatoes first, then follow with cabbages ; the cut-worm is less troublesome, and the land is in better condition.

With regard to manure, I have always used night soil and muck compost with salt, exclusively, not attempting even a small percentage of stable fertilizers for fear of club-foot ; the same cause forbids a successive crop. I cannot on my grounds raise cabbages on the same ground oftener than once in four years.

A. G. SWAN.

MIDDLESEX SOUTH.

Prize Report on Vegetables.

If, with the drawback of a long continued drought, such a variety and excellent quality of vegetables can be raised, with, as it would appear, only ordinary cultivation, why is there so much complaint among our farmers and mechanics who own gardens, of small yields and poor quality of roots and plants for table use? Probably a majority of the families in any of our towns raise vegetables enough, *of really excellent quality*, to give the housewife the means of getting up a really attractive and savory "boiled dinner," once a week, through the season. Perhaps in midsummer she manages to have a mess or two of pease and beans, and in early autumn a few beets and cabbages, and in winter some turnips. But the beets are stringy and small, and the cabbages are only leaves, and the turnips are hybrid, neither Swedes nor English. After using her best skill, she is mortified to find that no one really relishes the dinner. And yet everybody loves *good vegetables*, well cooked and served.

Very likely the failure lies in part in the careless manner of making the garden. Perhaps abundance of manure is used, not in a state suited to the wants of the tender embryos. Perhaps the land is ploughed so shallow that the surface becomes quickly dried to a powder. Perhaps it is planted at odd jobs, and in a hurry, and then left to the tender mercies of the old hen and her hungry brood. And what with a ready growth of weeds, and neglect of early stirring the soil and proper thinning, the result is inevitable.

A deeply stirred and thoroughly pulverized soil is a prime requisite to a successful garden. All the smaller seeds require such a fineness of mould, that, while it freely admits warmth and moisture, at the same time completely covers them, and secures against too ready evaporation Seeds planted in a lumpy bed, exposed to be drenched by a shower and parched by the succeeding hot sun, will not, of course, put forth strong, thrifty shoots. If, after a severe struggle, they live, it is to be dwarfish and sickly. And the hard-coated seeds, like the beet, and the oily-coated seeds, like the parsnip, need to be covered so deeply as to retain a maximum of moisture—such as would drown the lettuce.

And all seeds, to germinate well, want *seasonable planting*. Odd jobs and convenience may not suit them. The direction printed on most packages by the seedsmen, "plant early and throughout the season," hits the caprice of now and then a plant, and the views of all slack farmers, but not the nature of most vegetables. As a rule, each seed has its appropriate time for putting forth—a time when it will germinate and send out healthy roots and leaves—and which cannot be greatly varied without interfering with its normal growth. This is not a fixed day of the month, but a fixed condition of the ground, and atmospheric temperature. When the soil has become mellow, and the air of the proper warmth, then it is seasonable to plant. And neither before, nor much after this time, except in the case of such seeds as mature two crops in the year.

And this naturally leads to the statement of the universal practical rule in vegetable culture, viz.: time the planting, and prepare the soil so as to secure in all cases *quick germination and rapid growth.* The whole success of the kitchen garden depends on it. The quicker a seed can be made to germinate the more vigorous the shoot, the quicker the growth, the better the quality. Every one is familiar with this principle as applied to such plants as radishes and lettuce; but it is no less applicable to the larger vegetables. Seeds put in the cold soil of early April, and some seasons, of early May, never vegetate healthily. The chill they get necessarily engenders a consumption. A potato planted May 10, will, in our ordinary seasons, ripen its crop as early as one planted a month earlier, and the yield will be larger and of superior quality. The value of stimulants lies in the fact that a quick growth is secured; and where not overforced, the gain in this respect is very important. The rapid elaboration of the juices seems to add to their vital power, and, what is quite as valuable, to their perfection of quality. A cabbage or a beet that takes the whole season to grow is worthless for the table. Ninety days should suffice to mature most of our garden vegetables.

And in this connection it is obvious to mention the importance of *good seed.* Even with generous manuring, and timely planting, and careful culture, there is sometimes a failure which can be traced directly to poor seed—i. e., seed grown from immature plants, or such as had been injured by exposure to rains, or heats, or bad winter storage. And sometimes old seed which has lost its vitality is the cause of some disappointment. Unless he has made careful trials, no one is aware how much the quality of the seed has to do with the amount and character of the crop. Perhaps it is not extravagant to say, that, all other conditions being equal, a difference of fifty per cent. may result from the quality of the seed planted. The Committee have in mind two farmers, occupying adjoining farms, who oftentimes plant the same kind of corn, and pursue in the main the same method of cultivation; but the ordinary yield in one case is double that in the other. The one who has the heavy crop selects his seed from the standing stalks in September; while the one who has the light crop takes his seed from the bin at planting time.

As a rule, that seed is best which is ripened by the intense heats of July and August. And vegetables propagated from such seed are constantly improving; while vegetables grown from the seed of late maturing plants are sure to suffer a rapid degeneracy. And it is as important to select a seed beet, or squash, or onion, before harvest, as to select seed corn. The same is emphatically true of the potato. And the neglect of this rule is one cause why it so quickly "runs out" on a given farm, and requires to be regenerated by a change of seed. The hills for next year's planting should be selected when the vines have just reached maturity and are beginning to show the signs of natural decay. And only the earliest, and fully developed, should be chosen. Such tubers will not deteriorate.

As the potato has become so much a necessity for table use, and some new varieties are just now challenging attention, the Committee feel justified in giving the details of some experiments with the *Early Rose*.

No. 1. On fallow land. Long manure ploughed in; old compost and ashes put in hill. Furrowed three inches deep. One-half peck of seed, cut to single eyes: eyes dropped eighteen inches apart. Planted May 12; in blossom July 3; fully grown July 28. Single eyes produced three lbs.; forty-three eyes (two potatoes) produced seventy-five lbs.; total yield five and a half bushels. Tubers uniformly large size, with occasionally a diseased one, the disease confined to tubers growing on the surface. Excellent quality.

No. 2. On sward land. Furrowed three inches deep, with a liberal supply of compost of strong night soil and chip dirt in the hill. One-half peck of seed, cut to single eyes, and put eighteen inches apart. Planted May 24; in blossom July 10;

full grown August 4. Total yield six bushels; medium size; all perfectly sound; excellent quality.

No. 3. On deeply ploughed old land. Domestic guano in the hill. Planted, June 22, small whole potatoes. Shoots broke ground in seven days; in blossom July 28. Vines struck by the drought August 12. Tubers then the size of ordinary hen's eggs, with average of seven in each hill.

Results: Single eyes will produce as much *in weight* as whole potatoes, which reduces the required amount of seed to four bushels per acre. Covering deeply is conducive to soundness, and insures a greater yield. Strong manures, like night soil, are not promotive of disease. The quicker the growth the better the quality. J. H. TEMPLE, *Chairman.*

HAMPSHIRE, FRANKLIN AND HAMPDEN.

Statement of C. C. Thompson, Middlefield.

POTATOES: THE MASSASOIT.—This variety, a sample of which was exhibited at your fair, will compare favorably with the best known table potatoes. And no variety, of so fine a grain has yet come within my knowledge, that produces so abundantly. It resembles the Harrison in appearance, but is much superior in quality, and matures earlier, ripening with the Garnet Chili and Bresee's Prolific. The soil on which I have grown the present crop is a deep, gravelly loam,—moderately dry, and much less affected by drought than most of the land in this vicinity. It was cropped in 1868 with potatoes, Harrison being the variety, and produced about 130 bushels. For fertilizers I used ten loads, thirty bushels to the load, of stable manure taken from the barn cellar, which I consider worth a quarter more than the same bulk, after having received the *washing and rinsing* of the spring rains; also a large spoonful of phosphate in a hill. The land was ploughed deep, the manure spread upon the furrows and thoroughly incorporated with the soil by dragging. Crop of 1869, improved Long Orange Carrot seed, 400 pounds, manured as 1868 with the exception of the phosphate. The crop of 1870 was 223 bushels of 60 pounds each, or 13,380 pounds, with very little indication of disease. I plant in rows three feet by two and a half, drop upon the surface, two and three eyes to the hill. Level culture will not answer here. I plant potatoes of medium size, rejecting both the small and the overgrown,—selecting the type I wish to produce. Four bushels of seed were planted on the half acre; planted the 17th day of May; hoed when about five inches high; hilled about two weeks after the first hoeing with a cultivator operating upon a new principle, which did the work admirably. The land was prepared and manured the same as in 1868. Dug about the 25th of September, and stored in a cool, dry cellar.

STOCK.

ESSEX.

Essay on the Oakes Cow, by J. D. W. French.

In the Fourth Report of the Agriculture of Massachusetts, by Henry Colman, published in 1841, may be found an account of this famous cow. The cow was owned in Danvers, and produced in 1813, 180 pounds of butter; in 1814, 300 pounds; in 1815, over 400 pounds; in 1816, 484¼ pounds. During this time one quart of milk was reserved for family use, and she suckled four calves for four weeks each, in the course of those years. She produced in one week 19¼ pounds of butter, and an average of more than 16 pounds a week for three months in succession. The largest amount of milk given in one day was 44½ pounds. She was allowed 30 to 35 bushels Indian meal per year, all her own skimmed milk and most of her buttermilk. At one time the owner gave her potatoes, which increased the milk but not the butter. In the autumn he gave her about 6 bushels of carrots.

After reading this we must admit that she was an extraordinary cow; but at the same time we must admit that she had extraordinary feed. Can it be possible that more than fifty years have gone by, and with all our boasted improvements we have nothing to equal her? I for one do not believe it possible.

A cow, named Sybil, owned by Henry Saltonstall, of Peabody, was ⅞ Jersey and ⅛ Ayrshire, and weighed 950 pounds. She calved April 7, 1868, and gave from that time until April 7, 1869, 13,065 pounds, or more than 6½ tons of milk. In July, on poor and dry pasture alone, this milk made $12\frac{1}{2}$ pounds butter a week, or 1 pound for 12 quarts of milk. Her food was poor upland pasture, helped out for six weeks with green corn fodder, about a bushel of grain in all, between grass and roots, and in winter, dry hay and one peck of roots a day. She gave in the rest of April, 1869, 23 days, 23 pounds a day ; May, 1869, 31 days, $19\frac{1}{2}$ pounds a day ; June, 1869, 30 days, 17 pounds a day. Thus in 14 months of continuous milking, she gave 14,700 pounds, or about 7,000 quarts of milk. Average for the year, $35\frac{3}{4}$ pounds per day. Her greatest yield was 60 pounds, or nearly 30 quarts a day. Sybil certainly surpasses the Oakes cow in her yield of milk. Which was the most profitable cow ? I shall put Sybil's product in milk for the year, about 6,000 quarts, against the Oakes cow's product in butter, $484\frac{1}{4}$ pounds, her greatest yield. The milk of Sybil at 5 cents per quart would be worth $300 ; the butter of the Oakes cow, at 50 cents per pound, $242.12\frac{1}{2}$. Besides this we must make allowance for the suckling of a calf four weeks, and the quart of milk used in the family. Even this allowance would not make her as profitable an animal as Sybil, which was kept at a far less cost. Allowing 12 quarts of milk for 1 pound of butter, Sybil would have yielded 500 pounds of butter during the year.

In the Fifteenth Annual Report of the Secretary of the Massachusetts Board of Agriculture, is a statement of J. C. Converse, of Arlington, in regard to his Jersey cow, Lady Milton. She was kept in pasture in June and July, and in August and September received green fodder corn at night in addition. Her aggregate yield in butter in July was 79 pounds. From June 1st to October 7th, on green fodder without grain, $293\frac{1}{2}$ pounds, or an average of $15\frac{92}{100}$ pounds per week for $18\frac{3}{7}$ weeks. The first week in July her milk made 18 pounds of butter. Mr. C. says that the above-mentioned product per week for $18\frac{3}{7}$ weeks was not an exception to the general product, and that her feed in winter was good hay, steamed roots and corn fodder, mixed with a small quantity of shorts. The Oakes cow averaged more than 16 pounds of butter for three months ; but Lady Milton averaged nearly 16 pounds for more than $4\frac{1}{2}$ months, on green feed without grain or milk food. Her yield of butter for the year would undoubtedly (if any account had been kept) have gone up to 500 pounds.

I shall mention only one more of our modern cows. Jean Armour, an Ayrshire cow, imported by Mr. Peters, of Southborough, gave from June 1st to September 23d, 5,612½ pounds, or an average of 41$\frac{3}{16}$ pounds of milk per day. Allowing 20 pounds of milk for 1 pound of butter, this would have made a trifle over 280 pounds of butter for a period of not quite four months. During the second 10 days in June she gave 521½ pounds of milk, or 52 pounds a day. During the second 10 days in September she gave 462 pounds of milk, or 46 pounds per day. Her weight was 967 pounds. She was in good pasture after June 12th, and had three pints of corn-cob meal and 3 pints bran, and late in the season green corn stalks once a day. I think we may safely estimate that Jean Armour's yield in butter would have been at least 500 pounds for the year. During the period that the account of their yield was kept, Lady Milton was the equal if not the superior of the Oakes cow in butter. Sybil and Jean Armour were her superior as milkers, and all three were more profitable animals to keep.

MIDDLESEX.

Statement of J. R. Kendall.

I offer for your inspection to-day my herd of thoroughbred Ayrshires, consisting of the six cows, "Alice 2d," "Minna 2d," "Minna 3d," "Buttercup," "Mary Gray" and "Clover," and the bull "Alick Christie;" also the two yearlings "Dido" and "Dotty Dimple."

The superior qualities claimed for the herd consist in quantity and quality of milk, in quiet, gentle habits and disposition, and in the peculiar adaptedness of this breed as dairy cattle to our pastures and usual method of feeding.

The Ayrshires are proverbially a class of milkers, averaging in quantity, according to the amount of food given, more than any other; and it is yet to be proved that its quality falls below any other breed. During the flow, the average amount for the first six days in June, taken daily, was for "Alice 2d," 23 quarts, "Minna 2d," 24 quarts, "Minna 3d," 18 quarts, "Buttercup," 23½ quarts, "Clover," 25½ quarts. At the time of trial, the animals were fed only with grass, having no extra food of any kind, with the exception of "Mary Gray," which I was unable to dry before calving. Two weeks previous, Aug. 13th, she commenced to increase in her milk, giving at the time 6 quarts per day. Since then, being obliged to feed the whole herd in the barn on account of dry pastures, she has had, with the rest, corn-fodder and three quarts of shorts daily, and gave at the time of trial, the last week in August, 13½ quarts per day. I feed during the winter on dry hay, about 4 quarts of shorts, and a peck of cut roots to each animal; during the summer, only from the pasture, with green fodder, as the grass comes short. I raise milk only for the market; but during the summer, having a surplus quantity, a portion was set now and then for butter. This yielded cream readily; the butter "came" quickly; bright golden; and the milk thus tested contained 12 per cent. cream. No record could be kept of the proportionate amount to each animal, as the milk was used irregularly, to get rid of it in the easiest way, but so far as it proved an experiment of the butter-making qualities of the Ayrshires, it was eminently satisfactory.

It has often been asserted that this breed is especially nervous, excitable, and uncomfortable to manage. My own experience has been entirely the opposite, so that I make a special claim in this direction in their favor.

Notwithstanding the extreme dry weather of this season, want of food and water in the pastures, I have had no trouble whatever in keeping them where they belonged. I insist that they shall be kindly and carefully handled, and believe that, with the gentle, systematic treatment all our stock should have, the Ayrshires rank among the highest for quiet and peaceable habits; thus augmenting, in every way, their value for dairy purposes.

Statement of H. M. Clarke.

Swiss Cattle.—I offer for your inspection and premium my herd of Swiss cattle, comprising five cows and one bull, imported by me in November last; also four calves, the offspring of the above cows.

Unused to roots or grain, their keeping for the first eight months consisted of hay and water, nor did I think it advisable, until properly acclimated, to adopt a different course of treatment. Since the middle of July, owing to the drought and scanty pasturage, their keeping has been to each, daily, four quarts of shorts, two quarts of Indian meal, and corn-stalks up to the present time. In full flow of milk they give from twelve to sixteen quarts daily. Their butter qualities are good, as far as I can judge. A calf has been raised from each cow, and the milk being used for that purpose until lately, I cannot give a precise statement. However, there is a box of butter, made from their milk, on exhibition now on the Society's grounds. The heifer calf has been brought up by hand on her dam's milk; also the bull on his dam's milk; the steers have done their own milking. This, with one-half pint of meal, the same of shorts and hay, constitute the whole procedure of management.

WORCESTER WEST.

From the Report of the Committee.

The value of the different breeds of dairy cows depends very much on the fancy of their owners instead of their real merits or worth for making butter or cheese, and the final disposition of their carcass for beef. The Jersey or Alderney is taking the lead just now among gentlemen farmers and other professions with large fortunes, living in or near cities, and to them they sell for high prices, but are not much called for among dairymen, as their milk is best adapted to use in strong coffee or the making of fancy butter, which but few farmers can afford to use, especially if they are working hard and living economically, hoping thereby to clear the heavy mortgages from their farms. A Jersey cow when done giving good milk cannot be very valuable for beef. The Dutch have not been tried very extensively, and it is not probable they ever will be. The farmers of Worcester West want a large, good looking cow, that will give a great quantity of milk and weigh heavy when sold for beef. But there is no breed that will all prove extra milkers, and there is no man who can always tell an extra milker, let him feel of her ever so much.

Now, it is not certain because a cow is extra this year she will be next. There are many things which nearly spoil a good cow but seldom hurt a poor one, and many times no one can tell why or wherefore. Abortion is the most serious evil that has ever visited cows in this part of the country, and the most humble farmer knows just as much as the most celebrated veterinary surgeon in regard to the cause or cure; therefore the best way seems to be to let it take its own course (as it will without fear or favor), hoping it will leave us entirely in time, as it seems already to have done some herds where almost the whole have suffered. Good keeping has much to do with good cows; it is not much matter about poor ones. But little profit arises from mealing cows; certainly if heavily fed on meal they will not last as long, are more liable to disease and trouble in the udder, and the meal will not make extra milk enough to pay extra expense. But every man who has one cow or more, should plant corn to feed green, just as much as he plants his garden for family use. Let him plant some early, so that he can begin to feed soon as feed in pastures begins to fail, and plant some later, so as to keep his feed in his mowing lots until quite late; if it does not make an extra quantity of milk it keeps his cows in good condition, and he will get a large quantity of feed from a small piece of ground which will well pay for the labor. The white Maryland corn is best, as there are more leaves on it than on other kinds and it produces a larger quantity of feed. Some prefer the sweet corn, but there will not as much grow on the same ground as of the other kind, and if you buy the seed, sweet corn costs high. But every one should raise his own seed, which he can do by planting early and giving it a little extra attention. The best way to feed corn is in the barn. Go with your wagon to the field and carry enough at once to feed night and morning while milking. Cows love it, will eat it all up and feel happy.

Wm. Cushman, *Chairman.*

WORCESTER NORTH.

Statement of Augustus Whitman.

The mode of keep and feeding of my Shorthorns, also statements of the milking capacities of some of the herd, of which mention is made in several of the statements, can be told in a few words.

All milch cows are treated substantially alike. In winter they are fed twice a day, a bushel of steamed feed made from hay, straw and corn stover, and once with long dry hay. Of grain they have the equivalent of four quarts shorts and two quarts of meal. This is varied, and is found in corn meal, cotton-seed meal, ground oats and shorts.

In summer, until this year, they have been soiled on clover, grain, oats and fodder corn. This year they have had but one grain feed per day, the others having been one of dry hay and one steamed mess. Grain is given to cows in milk the same as in winter. My cows have never done better at the pail, until the drought compelled driving a long distance to water, than the present season, nor shown better condition.

"Senora" of Fairview.—Bred in Kentucky; dropped her last calf January 16, 1870. This milk record commences five months after calving. In June, fifteen days (16th to 30th) 412 lbs., average 27 47-100 lbs. per day. In July, thirty-one days, 779 lbs., average 25 13-100 lbs. per day. In August, thirty-one days, 641¾ lbs., average 20 70-100 lbs. per day. In September, fifteen days, 257 lbs., average 17 13-100 lbs. per day. Total for ninety-two days, 2,089¾ lbs.; average 22 71-100 lbs. per day. She has been kept in barn upon the usual winter feed, excepting one feed per day of fodder corn; of grain, four quarts shorts and two quarts of corn and cotton-seed meal mixed.

"Wenonah."—Four years old; calved March 27, 1870. In April, thirty days, 1,197¾ lbs., average 39 91-100 lbs. per day. In May, thirty-one days, 1,116¾ lbs., average 36 2-100 lbs. per day. In June, thirty days, 998¼ lbs., average 33 27-100 lbs. per day. In July, thirty-one days, 851¾ lbs., average 27 47-100 lbs. per day.

Total,—112 days, 4,164½ lbs. Average 34 14-100 lbs. per day. August 1st, she was taken from the farm to Fitchburg, for family use, where she now gives a large flow. No record of weight has been kept since July 31st. Greatest yield in one day, 44 lbs.

"Autumn Flower, 2d."—Calved February 27, 1870, at two years and five months. The record commences March 4th. She has been kept in the barn upon the usual winter feed, excepting one feed per day (since June) of cut grass, oats or fodder corn, and has had four quarts of shorts, and two quarts of corn and cotton-seed meal (mixed) per day. In March, twenty-eight days, 926¾ lbs., average 33 9-100 lbs. per day. In April, thirty days, 792½ lbs., average 26 42-100 lbs. per day. In May, thirty-one days, 749 lbs., average 24 16-100 lbs. per day. In June, thirty days, 742 lbs., average 24 73-100 lbs. per day. In July, thirty-one days, 673¾ lbs., average 21 73-100 lbs. per day. In August, thirty-one days, 602¾ lbs., average 19 44-100 lbs. per day. In September, fifteen days, 273 lbs., average 18 20-100 lbs. per day.

Total,—196 days, 4,759¾ lbs. Average 24 28-100 lbs. per day.

"Lady Carlisle, 2d."—Calved February 21, 1870, at two years and seven months. The record commences March 6th. Keeping, the same as Autumn Flower, 2d, above. In March, twenty-six days, 656 lbs., average 25 23-100 lbs. per day. In April, thirty days, 705½ lbs., average 23 52-100 lbs. per day. In May, thirty-one days, 659¾ lbs., average 21 28-100 lbs. per day. In June, thirty days, 622¾ lbs., average 20 76-100 lbs. per day. In July, thirty-one days, 533¾ lbs., average 17 22-100 lbs. per day. In August, thirty-one days, 480 lbs., average 15 48-100 lbs. per day. In September, fifteen days, 216 lbs., average 14 4-10 lbs. per day.

Total,—194 days, 3,873¾ lbs. Average 19 97-100 lbs. per day.

"Clarissa, 2d."—Statement of milk, in lbs., given by the Shorthorn cow Clarissa, 2d (at six years), from May 27, 1869, to March 22, 1870 (inclusive), 300 days. Her feed from June to October was green oats, grass, and fodder corn, cut and fed in the barn, together with two quarts of meal, and four quarts of wheat shorts. The winter feed was chiefly steamed hay, straw and corn stover. She calved May 25, 1869. In May, five days, 203 lbs., average 40 6-10 lbs. per day. In June, thirty days, 1,200 lbs., average 40 lbs. per day. In July, thirty-one days, 1,142 lbs., average 36 84-100 lbs. per day. In August, thirty-one days, 950 lbs., average 30 64-100 lbs. per day. In September, thirty days, 842 lbs , average 28 6-100 lbs. per day. In October, thirty-one days, 767 lbs., average 24 75-100 lbs. per day. In November, thirty days, 775 lbs., average 25 83-100 lbs. per day. In December, thirty-one days, 745¼ lbs., average 24 4-100 lbs. per day. In January, thirty-one days, 770¼ lbs., average 24 84-100 lbs. per day. In February, twenty-eight days, 700¼ lbs., average 25 lbs. per day. In March twenty-two days, 489½ lbs., average 22 25-100 lbs. per day.

Total,—300 days, 8,584¼ lbs., average 28 61-100 lbs. per day.

She continued to give milk until May 9th, giving to that date in addition to weight for the 300 days, 645½ lbs., making a total of 9,229¾ lbs. during the year. She calved again July 26, 1870, and gave in August, thirty-one days, 1,195½ lbs., average 38 56-100 lbs. per day. In September, fifteen days, 507¾ lbs., average 33 85-100 lbs. per day.

Total,—Forty-six days, 1,703¼ lbs., average 37 3-100 lbs. per day.

"Bellflower, 5th."—Statement of milk, in pounds, given by the Shorthorn cow, Bellflower, 5th, at eight years old, from November 9, 1869, to May 17, 1870, inclusive, 190 days. She had the usual steamed feed, together with two quarts of meal, and four quarts of shorts per day. She calved November 1, 1869.

In November, twenty-two days. 885¼ lbs., average 40 24-100 lbs. per day. In December, thirty-one days, 976¼ lbs., average 31 49-100 lbs. per day. In January, thirty-one days, 1,095¼ lbs., average 35 33-100 lbs. per day. In February, twenty-eight days, 962½ lbs., average 34 38-100 lbs. per day. In March, thirty-one days, 1,067 lbs., average 34 42-100 lbs. per day. In April, thirty days, 862 lbs., average 28 73-100 lbs. per day. In May, seventeen days, 457 lbs., average 26 92-100 lbs. per day.

Total,—190 days, 6,305¼ lbs., average 33 18-100 lbs. per day. May 18, she was removed from the farm to Fitchburg for family use, and no record of weight kept afterwards.

"Mountain Belle."—Calved August 1, 1870. Her feed has been dry hay, steamed feed and fodder corn, one feed of each per day, together with two quarts meal and four quarts of wheat shorts per day. In August, 5th to 31st, twenty-seven days, she gave 971¼ lbs. of milk, averaging 36 lbs. per day. In September, to 15th, fifteen days, she gave 468 lbs. of milk, average 31 20-100 lbs. per day. Her largest yield in one day was 41 lbs. (Aug. 9th). Her record for 1869, from March 7th, to December 31st, 300 days, is 6,162 lbs., an average of 20 54-100 lbs. per day.

Statement of E T. Miles.

"Beauty," No. 240 Ayrshire Herd Book, is nine years old, and dropped her last calf May 20, 1870. In six days, from the 6th to the 11th of June, 1870, inclusive, she gave 193 lbs. of milk, and for the six corresponding days in September, 1870, the weight of her milk was 159 pounds.

"Miller, 2d," No. 145 Ayrshire Herd Book, is eleven years old. She dropped her last calf September 6, 1870, since which time no record of her milk has been kept, as she is still suckling her calf. In 1869, she calved November 2, and in six days, from the 25th to the 30th of the same month, her milk weighed 198 pounds. Three months later, the last six days in February, she gave 156 pounds. The weight of her milk for any other six days will be given if required.

"Emma," No. 374 Ayrshire Herd Book, is nine years old, and dropped her last calf August 7, 1870. The weight of her milk for the prescribed six days in September was 183 pounds. Not being in milk in the month of June, no weight of her milk for any other six days is submitted. Her daily record is kept, and the weight of her milk for any six days that the Committee may designate, will be furnished.

"Daisy," No. 330 Ayrshire Herd Book, is nine years old, and dropped her last calf March 16, 1870. Her next calf is due February 21, 1871. The weight of her milk for six days, from June 5th to 11th, inclusive, was 176 pounds. The corresponding six days in September, she gave 128 pounds.

"Myrtle, 1st," No. 648 Ayrshire Herd Book, will be four years old in October next. She dropped her last calf, July 26, 1870, and the weight of her milk for the specified six days in September, was 167½ pounds. In 1869, she calved September 8, and in six days, three months later, December 8th to 13th, her milk weighed 125 pounds.

"Lady Burns," No. 524 Ayrshire Herd Book, was three years old, June 20, 1870. She calved January 18, 1870. Her yield of milk for the specified six days in June and September was 106 and 73 pounds respectively. She is due to calve December 30th next.

"Cleopatra," No. 311 Ayrshire Herd Book, was three years old, May 20, 1870. She dropped her last calf June 19 last, and her milk for the last six days of the same month weighed 166 pounds. For the six designated days in September her milk weighed 135 pounds.

The keeping of the cows here entered for premiums has been, in summer, such pasture as is afforded at Maplewood, with four quarts of "shorts" and from one to two quarts of corn meal per day. Occasionally, a little oil and cotton-seed meal has been substituted for an equal quantity of corn meal. In winter, good hay, with corn stover and such fodder as is usual to ordinary farming, with a small feed of mangolds or Swedes at noon.

The same quantity of grain is fed as in summer. The feed of the different animals is varied by their condition and circumstances, but the above statement is sufficiently accurate for all practical purposes.

In addition to the foregoing, I submit tabulated statements showing the quantity of milk given by each cow and heifer entered for premiums for the term of one year, to which the attention of the Committee is respectfully called.

E. T. MILES.

NANTUCKET.

THOROUGHBRED STOCK.—JERSEYS.—The Jerseys have been proved and fairly tested for twenty years in our State, since their first importation from Europe, to be remarkable for the quality of the cream from their milk. The cream has been known to measure one and one-quarter inches on a body of milk five inches high. None can doubt the butter-making properties of their milk; three hundred pounds of butter have been made from a single cow of this breed in this country. One statement mentions an average of four cows in one herd that averaged three hundred pounds each. If the farmer wants butter for a dairy product let him keep pure Jerseys. If he wants milk in quantity, the Ayrshire will give it, and the milk is eminently adapted to the manufacture of cheese. These breeds all possess some points of excellence, and each is preferable for some dairy requirements which others do not have.

The Shorthorn was the earliest of these thoroughbreds imported into our State, being introduced as early as the year 1818. It is well known as having come from the original stock brought into England by the Danes prior to the Norman conquest.

The Ayrshire began to be imported in 1831, and the Jersey or Alderney as late as 1851. Time will not permit us to more than allude to some of the peculiarities of these three breeds.

The native stock in our country has been much improved by crossing them with blood stock. The class of grade cows of each kind at the grounds was larger than ever before exhibited. There was a large number of fine bulls of each breed, all full-blooded, on exhibition; thus an opportunity is afforded our farmers of selecting such a grade as they wish to produce from their native stock.

Thorough-breeding is one of the most important but not the only essential for superior cattle; next to it is thorough-feeding. We want to learn how to feed them in their youth and maturity. There is a large field for investigation among our most intelligent farmers, as to the properties of roots, hay and grain for the sustenance of cattle, but all concede this point: high feeding pays the owner the most profit. All the gain in stock keeping is the difference between the cost of feeding and care and the ultimate production from the animal; hence the more food, up to the point of health, the more profit. We cannot expect a cow to furnish us more milk and butter than we furnish her materials.

A few years ago, before the organization of our county agricultural society, the great object in feeding cattle, with many of our farmers, was to see how much stock could be kept on their limited supply of hay. The result of such experiments was to turn from their barnyards in the spring a large herd of very small, emaciated, skeleton cows, that required extra care to restore them to ordinary flesh and health before they would return to their owners any milk or butter. Such cases would at this time call for the penalty in the statutes for cruelty to animals. Those barbarities have passed away with the generation. The farmers of this day believe it to be a humane and pecuniary policy to limit the amount of their stock, the number of their cattle, to the quantity of hay, pasture and feed which they have to dispense to them to feed well.

No reliance can be placed on our native stock as breeders; they have sprung from a mass of mongrel blood and ill-assorted races, and possess no hereditary traits. Hence the introduction of blood stock is a very important era. Like begets like; if we want illustrious progeny, we must look for illustrious ancestry. A distinguished agriculturist in this State has said, "When I look around upon the dairy stock of the country, as a mere matter of profit, I do not see any better class of cows than the ordinary native cows of New England; and if I was to-day getting up a herd of cows merely for the purpose of producing butter or milk, calculating the cost of those animals and what they would give the year round, I apprehend I might go farther and fare worse, than to select fine animals from our native stock." But, the gentleman adds, "the great difficulty about our native stock is their offspring; you can have no certainty that the children of these dams will equal in any respect the dams themselves."

A thorough sifting of native herds would much benefit the owners. Select from the herds all cows which give but twelve hundred to fifteen hundred quarts of milk per year, and sell or send them to the butcher, and supply their places with cows giving from twenty-five hundred to three thousand quarts per annum, or raise such stock; it will cost no more to feed the latter than the former. Many of our farmers measure and weigh the milk from each cow, and do not keep any that do not come up to their standard in amount of milk and quality. Careful and patient experiments would show that some cows were kept which did not really pay for their keeping; and with stock-keeping, as with all mercantile transactions, to make a thing pay well one must count the cost. There should be no conflict of feeling between the advocates of these respective breeds. There is room for all, and for native cattle also, if they are improved natives.

A few statistics may not be unimportant in considering the value of the dairy products of the United States. The total product of butter in the United States and territories, in 1850, was 313,345,306 pounds; in 1860, 469,681,372 pounds; being an increase in ten years of 46 per cent. We have not the statistics of 1870, but at the same rate of increase they would give an amount of 685,934,682 pounds; which, estimated at 33⅓ cents per pound, would be worth $228,578,224. In our own State, the valuation of cows and heifers in 1855 was $4,892,291; in 1865, it was $6,537,630; an increase of 33 per cent. in ten years. At the same rate of increase, it would give $8,716,840 in 1875. The product of the dairy of this Commonwealth, in 1855, was $2,898,696; in 1865, $3,091,462. At the same rate of increase it would be, in 1875, $3,292,392.

The number of cows in this State far exceeds that of any other animal we have,—90,000 horses, valued at $9,000,000; 50,000 oxen and steers, 175,000 cows and heifers, and 150,000 milch cows, which shows clearly the importance of dairy stock in our Commonwealth.

We had in this county, in 1865, 450 milch cows, 126 heifers; total, 576; oxen and steers, 60; neat stock, 636 head; horses, 257. It is fair to presume that we have over 500 milch cows in this county, at this time, and 150 heifers; total, 650. The amount of milk product in our county, in 1865, was 25,000 gallons, valued at $6,250; butter, 18,000 pounds, valued at $7,200; total valuation of dairy, $13,450; value of farms, in 1865, $160,000; value of farm stock, &c., $242,805; value of annual products, $129,842.

It is good policy to keep all the stock that can be well fed and housed. The old French proverb is a wise one: "No cattle, no farming; few cattle, poor farming; many cattle, good farming."

In conclusion, let us urge upon the consideration of all, the importance of high feeding, and proper care in erecting comfortable barns where their cows can be sheltered, days as well as nights, from the bleak winds and storms which sweep over our plains. Attention to these conditions will make excellent cows; neglect them, and the purest blooded cattle ever impoted from the islands of Jersey, Guernsey or Sark, the moors of Scotland or the luxuriant lawns of England, will not be worth the cost of keeping.

ALEXANDER MACY, JR.

PEDIGREES OF STOCK.

BERKSHIRE.

From the Report of the Committee.

For the first time in the annals of the Berkshire Agricultural Society a Committee on *Pedigree* has been appointed, and has performed its duties, and the importance of such an innovation demands more than a passing consideration.

"What is a *pedigree?*" is the first natural inquiry of the uninitiated. We can only say that it is an account or register of a line of ancestors, human or otherwise. Its value among stock breeders consists in the evidence which it brings that the animal is descended from a line, all the individuals of which were alike and excellent of their kind, and so almost sure to transmit like excellences to their progeny. Pedigree is especially valuable "in proportion as it shows an animal to be descended not only from such as are purely of its own race or breed, *but also from such individuals in that breed as were specially noted for the excellences for which that particular breed is esteemed.*" Every animal, of course, has a hereditary history, but it is only certain races or breeds which have been kept distinct for numbers of years whose pedigree is valuable, the others having so intermixed that it would be impossible to furnish a record of their ancestry. Pedigrees of horses, and bulls, and cows, as well as of the human race, were kept in families long previous to any regular herd book, the first English herd book of Shorthorn stock being published in 1822, and the first American in 1846, and now we have also regular published records of the Devons, Jerseys and Ayrshires, to which will soon be added that of the Dutch. Any pedigree committee must be guided and controlled by the herd books as to those breeds whose history they purport to record, and as to others by such written or oral evidence as can be furnished by the owners, and it is, therefore, of primary importance that every owner of a pure-bred animal should have the birth and lineage recorded in the proper herd book. This adds to the "money value" of all thoroughbred stock, as the first inquiry of a purchaser of it or its progeny is as to its record, just as a purchaser of real estate expects to find its title in the books of the register, and if the documents are not recorded, a just suspicion attaches to the purity of the lineage or title. Every one is aware of the fact that all animals derive from their parents certain permanent and inalienable characteristics—that as a general proposition *species is constant;* and though certain great naturalists have disputed the absolute fixity of species, contending that new species may arise by accidental variation and "natural selection," we have no direct evidence of this taking place, but on the contrary the experience of the past is pretty conclusive that *parents live in their offspring.* Parents transmit their individual peculiarities of color, form, longevity, idiosyncracy, &c., to their offspring, as a general rule, both parents being always represented, but which is the predominating influence is not ascertainable, sometimes the male preponderating in one direction and the female influence in another, yet this direction being by no means constant, and often reversed, and the direction being undoubtedly controlled by the age, strength and other qualities of the sire or dam. Bakewell, the famous English breeder, would let or sell his rams, but held his ewes sacred, neither selling nor letting them, considering the female influence preponderated to the best advantage. Many farmers consider that the property of abundant secretion of milk is more certain to be transmitted from a bull than from a cow, whilst the majority are careless as to the character of the bull, provided the cow is of a good milking family. In the scale of humanity, all men of genius *are said* to have had remarkable mothers, yet a history of "hereditary genius" shows that as many men have been indebted for their intellectual qualities to the male as to the female side of the house. As no positive rule can be laid down, the best to follow is to have both sire and dam as near perfect as possible, and then we can say of the progeny,

> "Half is his and half is hers; it will be worthy of the two."

To every general rule there are always some exceptions; and while proclaiming as absolute the law of individual transmission, that the parents are often reproduced in their offspring, we are met by the obvious fact of the offspring often exhibiting so marked a departure from their parents, that the law seems at fault. The most singular modification of this law of inheritance is known as *atavism* (from the Latin atavus, an ancestor), in accordance with which the individual does not resemble either parent, but the grand-parent or some ancestor in either the direct or collateral line. Exceptions of this sort are common in the human species, and not unfrequently among the lower animals, which sometimes bring forth young so utterly unlike themselves as to have been long mistaken for different species; while these young in their turn bring forth animals exactly like their ancestors.

There are certain other perturbing influences to explain, which would be to solve the whole mystery of heritage, and we can only cite a few instances. A striking case, which has become celebrated, is that of an English thoroughbred mare, which in the year 1816 had a mule by a quagga—an animal of the zebra kind—the mule bearing the unmistakable quagga marks. In the years 1817, 1818 and 1823, this mare again foaled, and although she had not seen the quagga since 1816, her three foals were all marked with the curious quagga marks. Among our pure white Chester County hogs we often find a litter partly black, owing, undoubtedly, to a crossing, generations back, with the Berkshires. These facts suggest the importance to breeders of observing narrowly the first breedings of the heifers, as a taint of impurity from inferior stock may infect their whole progeny subsequently, and also of the importance of scrutinizing severely the pedigree of any animal to be purchased for breeding purposes, that it may be ascertained that he or she is "descended from a line of ancestors in which for generations the desirable forms, qualities and characteristics have been uniformly shown." Climate, food, age, health, &c., exert influence upon individual variations; the offspring of an old male, for instance, and a young female, resembling the father less than the mother in proportion as the mother is more vigorous and the father more decrepit, the reverse being true of the offspring of an old female and a young male. An animal born of mature parents comes to its full growth and the enjoyment of its functions much earlier than those born of parents still young. Lambs born of *old* parents were said by Columella, the old Roman agriculturist, to have but little wool, and that little coarse, and to be often sterile.

But notwithstanding these exceptions, a knowledge of which is important to every breeder of pure stock, the transmission of physical and mental qualities from parents to offspring is one of those general facts of nature which lie patent to universal observation. Children resemble their parents. Were this law not constant, there could be no constancy of species. "The horse might engender the elephant, the squirrel might be the progeny of a lioness, the tadpole of a tapir." But a sheep is always and everywhere a sheep, a man a man, a pure-bred Shorthorn is the progeny of Shorthorn ancestry; but though the species is always reproduced, the *individual* may not be. Yet, though the variations occur in the individual type, they are not common, and we may look, in breeding, to produce like from like; and it is of the utmost importance, if we wish the best progeny, to breed from the best parents, whose lineage can be traced back through a line of uncorrupted ancestors. "Heritage," says a profound philosopher, "has in reality more power over our constitution and character than all the influences from without, whether moral or physical." 'Tis but a few years since that the number of thoroughbred animals in Massachusetts could be counted on our fingers; now they number by hundreds, and every agricultural society in the State not only encourages their production, but most of the societies are helping them round by abolishing the premiums on grade bulls, and so discouraging the raising of animals whose corrupt blood may taint that of the thoroughbred or their progeny. It is equally important that each society should have a committee annually, whose duty it shall be to see that every animal entered for premium as thoroughbred has its lineage recorded in the proper herd book of its race, if one is published, or so established by proper written muniments that no doubt can exist of its purity of blood. Every owner of thoroughbred animals should enter them with the secretary of the society a few days before the fair opens, with a proper pedigree or reference to the volume of the herd book where it is recorded, and the committee on pedigrees should, at the opening of the fair, pass upon such pedigrees, so that the list go into the hands of the examining committee for premiums marked understandingly, approved or disapproved.

R. GOODMAN, *Chairman.*

HOUSATONIC.

From the Report of the Committee.

The Committee beg leave to suggest to the society that it would greatly facilitate the labor of a committee on pedigrees, and render their decisions less liable to error, if the rule should be established, that every member offering animals for premium, as thoroughbred, be required to show that such animals, or their sires and dams, have been recorded in a herd book of recognized authority.

We think it for the credit of the county that its thoroughbred animals should be enumerated in the official catalogues, which are widely distributed throughout the country, as well as for the interest of the owners and breeders of these animals. Such record is the most sure and convenient test of the purity or impurity of blood in all cases of doubtful pedigrees. Whenever there is not sufficient evidence of thorough breeding to secure admission of an animal into a herd book, such animal ought not to be allowed to compete for the society's premiums as a thoroughbred. If it be left every year to a different committee to decide what animals offered for premium are of pure blood, conflicting decisions may arise, and the society may be left in a state of doubt whether its so-called thoroughbreds be not merely grades. The expense of record is small—fifty cents or one dollar for each animal—and no member who takes pride in owning blooded stock will be apt to object to paying this sum for a certificate of its purity.

It may be added for the information of all members interested that the standard herd books, for the breeds of cattle for which premiums are offered by the society, are as follows:—

Shorthorn Herd Book, edited by Lewis F. Allen of Buffalo, N. Y.

Ayrshire Herd Book, edited by J. N. Bagg of West Springfield, Mass.

Jersey Herd Register, edited by George E. Waring, Jr., of Newport, R. I.

Devon Herd Book, edited by H. M. Sessions, Wilbraham, Mass.

In the case of the Durham, or Shorthorn Herd Book, it should be understood that a considerable number of the pedigrees contained in its first few volumes are imperfect, and the leading agricultural societies have taken the ground that no Shorthorn animal is thoroughbred unless his pedigree can be traced back, on both sides, to ancestors recorded in the English Herd Book. We think the same rule should be adopted by this society.

We also recommend that every member competing for premiums for thoroughbred animals be required to deliver to the secretary the pedigrees of such animals in writing, made out in full, and signed by the competitor, before ten o'clock of the first day of the fair.

In conclusion, the Committee beg leave to call the attention of members to the importance of increasing the number of thoroughbred cattle in this part of the Commonwealth. It is true that we have already a good breed of native cattle; but it is also true that it can be greatly improved by a larger infusion of the blood of thoroughbreds. It is now generally believed by intelligent persons that wherever the full-blood Durham bull is used on native cows, he improves the beef; wherever the Ayrshire bull goes, he adds to the milk and cheese; wherever the Jersey goes, he increases the butter.

It is also generally admitted that thoroughbreds have this great advantage over natives, that they transmit good qualities to offspring with more certainty. For example, if a full-blooded sire and dam are remarkable beef or cheese or butter producers, it may be relied upon as very nearly certain that their female offspring will possess the same characteristics. A good thoroughbred cow is sure to bring a good calf. Now, we all know that native bulls and cows are very uncertain breeders. Our good native cows often bring calves quite unlike themselves in quality. Their blood is so mixed, the good with the bad, that sometimes the good is inherited, and sometimes the bad. Hence the farmer is often disappointed in his breeding, and cannot rely with any certainty on making improvements.

This important truth may be well illustrated by the recent experience of a member of the society in raising corn. Having planted the large white Sandford corn by the side of the smaller Canada, he obtained some very handsome ears, containing kernels as yellow as the Canada, and as large as the Sandford. Thinking he might get an improved variety, he planted, in the year following, those kernels by themselves, and so far from other kinds of corn that there could be no mixing with them. The result was very inferior ears, with kernels not all yellow, as the seed had been, but some yellow and some white. Instead of continuing to improve, the corn deteriorated.

So it is with cattle. The first cross of two different breeds often results in producing a good animal; but when these crossbred animals are coupled together, it is a well known fact that the issue is almost always inferior, yet most of the grade bulls of our county are such cross-breeds. Their get is oftener bad than good. We are therefore of opinion that the wealth of this farming community can be very greatly increased in the next ten years by immediately disposing of all such stock-getters, and using thoroughbred bulls in their stead.

THERON L. FOOTE, *Chairman.*

HEIFERS.

PLYMOUTH.

From the Report of the Committee.

During the three years we have served on the Committee on Heifers, there has been a marked change in this class of stock: the Jerseys were then in the hands of a few, but they now seem to be almost the only breed which our farmers think worth rearing for cows. In our own experience they have proved very satisfactory as to butter, and if properly bred they give a fair quantity of milk, the cream being very thick, and yielding more butter from the same amount of cream than that of any stock we have ever known.

The statement of Henry M. Porter was the only one which gave the pedigree. This we think should always be done, whenever it is known, as it adds character to the stock and leads to more care in breeding.

Mr. Porter's heifer was the only full-blood Ayrshire offered, and was a very fine specimen, though a little under-sized. The Ayrshires have always found favor with us for the dairy. We have found them very hardy, and well calculated to thrive on short pasturage. They endure long winters well, give a large quantity of good milk, and have strong, healthy calves. We hope to see more of them on exhibition in future.

As we are expected to give our reasons for our decisions, we will state what we consider the essential points in a heifer, that those who offered animals of that class may see the reasons for awards, and also the causes of failure. In choosing a heifer, we want to see the udder broad and large, with four good-sized teats, standing well apart both ways, skin yellow, with fine hair, tail slim, hind-quarters heavy, hips broad, straight back, fore-quarters lighter than the hind, neck slim, horns small and near together, eyes large and clear, nose long and slim. In size we prefer medium. A fine-boned animal, rather under-sized, is preferable to a large, coarse, overgrown one.

We would also urge it upon all who rear calves to provide themselves with some kind of root crop for their young stock, particularly through their first winter. We prefer it to grain, as it keeps them in a good, healthy condition. Of four which we fed last winter, three had one-half peck each, per day, of turnips, the other, a pint of corn-meal daily; those fed on turnips came out in the spring in much the best condition, both as to size and flesh, to say nothing of the satisfaction experienced in seeing good, thrifty young stock, and if a farmer finds no pleasure in that, he may safely conclude he has mistaken his calling.

Your Committee would also suggest some improvement in the accommodations for exhibiting heifers. As some of them are now placed in the pens with other stock of an entirely different class, and many of them at some distance apart, there is no chance for comparison, and it is very difficult to decide upon the particular merits of each individual animal. We would therefore recommend that, in future, they may be located together, either in pens or stalls expressly for their accommodation.

We would also recommend that each breed should have a grade of premiums. As it now is, the first premium is to be awarded to the best animal, irrespective of breed. Now, each member of the Committee is of course prejudiced in favor of the particular breed that thrives best and is the most profitable on his own farm; and where each member is in favor of a different breed the decision is necessarily biased, and that animal takes the first premium whose champion happens to possess the most fluent tongue, or is the most tenacious of his own opinions.

There were many fine animals of this class on exhibition, which showed good care both in their breeding and keeping, but which failed to take a premium because there were not premiums enough offered; and if the suggestion that we made above were acted upon, it would give competitors a better chance. We find by experience that it is better to have a heifer drop her first calf when about two years old; and if it is desirable to have a cow that will hold out with her milk in the succeeding years until near calving, she should not be allowed to go farrow until after her second calf, as a farrow cow is apt to go dry some time, and so form a habit that is often very hard to overcome. We also consider it very important that a heifer be mated with a full-blood bull for her first calf, as a scrub bull then is apt to show more or less on all her future progeny, and we have sometimes thought we could see bad effects on the heifer herself. We close this Report by once more expressing our gratification at the improvement manifested in this class of animals for the past three years, and hope to see it continued until every farmer among us can point with pride to each animal of his stock as worthy of exhibition.

JOHN M. SOULE, *Chairman.*

HORSES.

MIDDLESEX SOUTH.

Report on Farm Horses.

The Committee on Farm Horses, single, have made the awards, and are disposed to add a few words by way of suggestion. It has seemed to them that the exhibition of farm horses, from year to year, has not resulted in an increase of the number of truly valuable ones. At least there is no evidence of such increase in the number of entries for trial at our show. Therefore we are at liberty to draw the conclusion that practically this trial is merely a matter of curious interest for the hour to the multitude, and a gratification of pride to the winners of premiums. We do not learn that the result has been to set any man to studying to learn how he can train *his* horse to do the same work or *any* work more easily than before, or how best to manage him to secure the least wear and tear of muscle and of patience in the horse and in himself also.

We think it has been too much regarded as a happy accident, if a man got into his possession a horse that could draw or back more than his neighbor's horse, and whether it came of somebody's careful training or of the native power and noble willingness of the horse has not been a subject of inquiry. Neither has anything come out of such exhibitions that would help a young farmer or teamster to select the most suitable style of horse to do his work, or give him any hints on managing such a horse as might fall into his hands. To this desirable end we think this public exhibition should tend, and we have endeavored to draw from the exhibitors such facts as were likely to bear in that direction, and present *them* instead of our own opinions. But the exhibitors had not expected to be questioned, and but little was gained in that direction. Every one knows that the pains now taken to develop muscular power, and other really profitable qualities in farm and team horses, is far exceeded by the efforts to secure the highest speed. Why this should be in a community so largely made up of people who are dependent on animal power, and not on speed, for their support and comfort, is not easily explained.

It would seem that men who, in erecting buildings or in other enterprises, show so much shrewdness and provide so wisely to secure economy and comfort and durability, would have more regard than we are wont to see to the proper development of the same useful qualities and conditions in the horse. Who has not seen, here and there, a horse of thirty years old or more, sound and kind, and learned that one owner had been his master, and had made him what he was by care and training! And who has not noticed with surprise, and pity also, the great proportion of unsound, balky or otherwise unprofitable creatures, made so from ignorance or carelessness! But at present we are not disposed to discourage the development of speed. But we *do* say that *equal* inducements should be offered to encourage the development of good working power; that the *greater* good should not be sacrificed to the *less*. In this way only will this part of our agricultural interest keep its proper position.

At the trial just made we found that two of the three horses entered were entered last year, and took, one the first and the other the second premium then. The former rule of the society would not have allowed them to compete for the same premium again. The *new* rule does allow it, and it were reasonable to expect that the same result would be reached again. But your

Committee have understood that the age and weight of the animal, and any other circumstance in the history of the horse or his training, might be taken into the account. In making our award, therefore, we could not follow our predecessors, but our own judgment.

From the fact that, in a society embracing eleven towns, only three horses should be entered for trial, your Committee are agreed to urge that this part of the exhibition should be entirely omitted, or such inducements offered, and with such conditions, as will call out an attractive and profitable display of working horses and tend to increase their number and value.

C. S. WHITMORE, *Chairman.*

HAMPDEN.

From the Report of the Committee on Stallions.

Of this class of horses but two were exhibited, and, unfortunately for their owners, neither had the conditions which entitled them to an award from the society. It is not unreasonable, however, to suppose that there are within the county other and eligible horses of good breed and quality; and it is to be regretted that their owners did not feel interested enough to bring them to the exhibition. Horse raising is not carried on to much extent in this region. With the limited range of pasturage and the increasing expense of raising horses, it is not likely that it will increase; most of our farmers preferring to depend for their horses upon other sections where pasturage is more extensive, and where the cost of raising can be so reduced that the value of the horse when fitted for work will come nearer to their pecuniary means. It is only here and there that one cares to undertake this work, and then only in a limited manner, either because possessing a favorite mare, from which he hopes to raise a "likely colt," or because he has unusual facilities for the time being to make the attempt. It is therefore desirable, if one should undertake it, that the best material should be selected, in order that the experiment may have a good chance for success. To incur so much expense and trouble and then raise an inferior animal is the poorest kind of economy, and, although we regret to say it, yet so far as our observation goes this seems to be the general result. Our farmers either do not understand the art of raising good horses or else they have been very unfortunate in their selection of breeding animals, for it is a fact that very few first-class horses are raised in this section.

The reason for this we apprehend lies in the fact of not having first-class thoroughbred animals, male and female, to breed from. The old trite rule "that like produces like" is too important and too true a maxim to be neglected ; and although there may be an occasional exception, yet its truth has been so often tested that it is a mistake not to remember and practise upon it. This has been well exemplified among the breeders of neat stock, as seen in the different herds of Durhams, Ayrshires and Devons. To obtain the excellent qualities which distinguish these different breeds, a systematic and intelligent method of breeding has been followed, and the qualities most desired have been diligently sought. The same course is to be followed if we would either improve the present race of horses or create another and a superior one. To be successful in the raising of stock, the principles of correct breeding should be thoroughly understood, and the rules to be followed should be carefully studied, so that, aided by observation and experience, an intelligent system can be devised, which, being steadily pursued, greater certainty of obtaining the best results will be assured. When everything is left to chance there can be no reasonable prospect of success. We have not time to discuss at length the principles of correct breeding. The books upon the subject are full of instruction. A few suggestions which occur to us, and which are often overlooked, are all that we can offer.

And first, a rule which should not be deviated from is, never to breed with imperfect animals, female or male. We mention the female first, because many farmers believe that it makes but little difference whether the female is perfectly sound and vigorous or not. A mare that has done good service both on the road and on the farm is now broken down with hard work. She has arrived at an age when the powers of life are beginning to fail, and as she cannot work with her accustomed energy, she can be "be turned out to light work and the raising of colts." Now, although she may not be blind or lame, and is apparently sound, yet she is not in the full vigor of life, when all her physical energies are in full play, and when she is capable of giving to her offspring to the largest extent that nourishing aliment which gives to bone and muscle and nerve the development which produces strong and vigorous animals; neither can she impart in a great degree those qualities which give spirit, energy, courage and endurance to her progeny. Dull, stupid, exhausted herself, the colt will undoubtedly be like her.

If from any cause the female has any defect, either being blind or lame or having other imperfections or unsoundness, then she ought on no account to be used as a breeder, for it may be impossible to determine whether the defects are acquired or hereditary, and, of course, transmissible. Unless it is very certain that the defect is the result of accident or springs from some well-known cause, it is far better to reject her. It is not reasonable to expect perfect, sound, vigorous colts from old, worn-out, broken-down and imperfect mares. What is true of the female is likewise true of the male. The stock horse should be, in every particular, the most perfect of his kind, and it should be positively certain, from well authenticated records, that he comes of good stock. If alleged to be of an old race that has transmitted for generations those fine qualities which have given it its celebrity, be well assured that this particular horse from which you breed does in reality belong to that race, that he is truly "the worthy son of a worthy sire," and that in his veins courses the blood that has made his ancestry famous. Never overlook the fact that "it is blood which tells," and unless this is of the "true strain," you have no surety that your colt will possess the qualities of the race. The time at which a mare should begin to breed is not definitely settled; but if she come of good reliable stock, whose qualities and excellences have been well established, we recommend that she commence at the beginning of her third year. By so doing there is a gain in time of a year; being at grass and as yet not fit for work, she loses nothing herself, while she gains so much by bringing a colt.

There is no risk in this, for by this time, if she has been properly fed and cared for, she is sufficiently developed; being young, vigorous, full of rich, nutritious blood, with an unbroken spirit, the fire of youth burning lustily in her system, and her whole being teeming with the forces and energies of youthful life, she can transmit them, together with the qualities of her race, in full strength to her offspring. If, however, you know nothing of the origin of the mare, but yet, after having been "broken to work," she exhibit qualities of a high order, is sound and possessed of vigorous health, and being satisfied that she will be likely to bring good stock, even if not thoroughbred, she can, after being thus tested, try her luck.

A very important point in breeding, and which is rarely if ever considered, is the *character* of the breeding animals. All animals have both a moral and intellectual character, varying in degree perhaps, but yet fixed and determined, and it is high time that these qualities were recognized.

The horse is one of the most intelligent, sagacious, docile and tractable of all animals, and under proper and judicious training can be made to do everything which comes within the range of his ability. Naturally generous, affectionate and confiding, he attaches himself to his master, and is ever ready, with kind and yielding disposition, to do within the limits of his capacity all that can reasonably be required of him; and all that is necessary to make him kind, amiable and gentle, and at the same time increase his knowledge, is to recognize this capacity, and by careful education to develop his mental and moral qualities as much as possible. There are, however, some horses which are inherently vicious; they have ugly tempers, are cross, unmanageable, will bite, kick, are obstinate and wilful, possessing and constantly exhibiting a natural depravity. A horse of such character is well nigh useless, and although having other good qualities, they are overbalanced by this evil disposition, and to breed from such an animal is nothing short of wilful wickedness. With all their good qualities this ugly and ferocious temper renders them unfit for breeding purposes, for it must never be forgotten that bad qualities are as easily transmitted as good ones, and to breed from such horses is not wise, for their use is not only limited to the performance of certain kinds of work, but they constantly put in jeopardy the comfort if not the safety of those who have the care of them.

One point more we mention, and that is *temperament*. It is a subject of which few stock raisers have any knowledge whatever or ever think about, and fewer ever care to take the trouble to study and comprehend it. It is, however, so connected with the character and the disposition of the horse as to be of the first importance, and every intelligent breeder should give it thoughtful consideration. Temperament depends "on the state of the mind as promoted by the composition and states of the organs of the body." These differences of organization may be ever so slight, yet their subtle influence is such as to make and determine those different distinctions which constitute in animals that condition or state which is called temperament. It is not to be understood, however, that these differences are owing to any physical defects, but rather to those states of feeling which are promoted by the state and composition of the organs of the body (which are perfectly healthy and sound), but which influence the mental strivings and emotions of animals whereby they are distinguished in their different temperaments as nervous, sanguine, phlegmatic, etc. Without pretending to decide how far these distinctions exist, it is yet obvious enough they are sufficient to make the most mental differences so decided as to require a careful discrimination on the part of those who wish to raise an improved and superior class of animals. As a rule, animals of similar temperaments should never be allowed to breed together. Similarity of temperament in the parents is most surely apt to develop in the progeny that temperament in excess, and will produce glaring defects in character and disposition. Take, for instance, the nervous temperament; this, when rightly balanced with qualities harmoniously blended by a union with the opposite temperament, gives that high, spirited feeling, lofty action, proud carriage, that active energy and indomitable courage and power of endurance which especially distinguish all first-class thoroughbred horses.

Such horses, beside being well developed physically, have finely organized brains; they are naturally generous and affectionate in disposition, intelligent, tractable and easily managed, yet full of fire and resentful of injury and bad training. But take those of the same nervous temperament and breed them together and you will develop it to such an extent that it overleaps the bounds of a healthy prudence, and instead of an increased improvement, you produce decided defects. This is one cause why close breeding, or "breeding in and in," ultimately deteriorates the stock. Horses bred of parents of similar nervous temperaments, for illustration, will be exceedingly sensitive; they will be exquisitely alive to every impression, constantly on the watch, excitable and frightened at every object, however trifling. Such horses are difficult to manage, they are unreliable, the conduct of to-day is no indication of what it will be to-morrow. At one time calm and quiet, and then suddenly, for slight causes, they become excessively excited and well-nigh unmanageable, and if in addition the temper is bad, it will be exhibited in all its viciousness. Such horses, however, may be fast travellers, and some of them may have strong powers of endurance; they have usually elegant and well developed forms, especially if they are thoroughbred; they have fine skins, and soft, silky hair and mane, delicate but well proportioned limbs, and quick, active movements; yet with all these admirable qualities, they are so delicately and finely organized and possess so much excitability of brain and nerve that they soon begin to fail and rapidly wear out. We might extend these remarks further in reference to the other temperaments, and treat of their excellences and defects, but enough has been said to direct attention to a matter which is deserving of serious consideration. If we are ever to have a breed of good horses, possessing as far as possible every good habit and excellence; if we are ever to establish a scientific, philosophical system of breeding, one not subject to the results of chance, but reliable from the working of fixed and well defined principles, it must be done by a thorough and comprehensive knowledge, not only of the physical organization of the horse, but of all those laws which govern his whole being, those laws and principles on which are depending the highest development of all those qualities which go to make the most perfect animal.

P. LeB. Stickney, *Chairman.*

BARNSTABLE.

From the Report of the Committee.

Horses, Stallions, Mares and Colts.—The Committee on horses, stallions, mares and colts beg leave to urge upon the farmers of Barnstable County the necessity of continued attention to the breeding, more particularly, of this noble animal. The horses of our county at present cannot be claimed as of any particular breed. In fact, there is no particular breed that is just suitable for a horse of all-work, a kind necessary for our purpose. If we want mere race horses we should be compelled to procure the thoroughbreds or Arabians. If simply carriage horses, the coach horse of England. If trotters alone, we should be driven to the Black Hawks or Messengers; and if only the perfect dray horse, the Conestoga, or heavy-limbed horse of Pennsylvania. But we want one horse, and that a horse that will plough and trot well and carry a buggy in shape, and, in fact, change from one employment to another with all ease.

And so our horses have some Morgan and some Black Hawk and some Messenger, and in fact a mixture of all sorts, good and bad, but still we have such as we have, and must make the best of them. The only way left for us is to improve, if possible, on what we have got. There are questions in the matter of breeding that we do not propose to touch. For instance, "which has the greatest influence on the colt, the dam or the sire" when they are both of equal blood? Able horse men have been found to defend each side. In the summing up of all their arguments we have come to the conclusion that collateral circumstances have very much to do with the whole matter; so much so that no positive rule can be laid down. Sometimes the sire has more vital power and nervous strength than the dam, and his peculiarities will predominate. Then again the dam, from youth and peculiar vigor, will take the lead. But when you come to animals of different degrees of blood. we can come to a safer conclusion. It is now a recognized fact among breeders that whichever of the two animals is of the purer race, the peculiarities of that one will be transmitted in the greater degree. The Devons, among bovines, are a very striking example of this trait. No matter what kind of cows you have, the Devon sire invariably produces a red calf with a whitish tuft to its tail. So that farmers may come to the conclusion that the procuring of the best blood in the sire will increase the value of their stock. No scrub, no mongrel, no coarse-blooded male of any kind should be employed, if a pure or nearly pure blood can be procured. The little difference of the cost of the services of a good animal ought not to weigh a moment in their minds.

There is one point in breeding that is not universally known, which we should state at the very threshold of our remarks on the breeding of colts. That is, that there is a lasting influence conferred on the mare by her first stallion. If this is so—and there is no doubt of it—how careful ought the farmer to be when his mare is about to produce her first colt. The greatest care should be taken that the horse is of unexceptionable blood, for all her colts thereafter will certainly resemble him in some way. Every dog breeder knows that if his pure dog-mother has her first litter of pups by a mongrel cur, the purest dog of her own breed will never get a litter from her that will not contain one pup, at least, of mongrel character and appearance. Why this is we do not undertake to explain, no more than we should undertake to explain why a widow's children by her second husband are often striking likenesses of her deceased husband, or why the infant of two extremely ugly persons will be a beautiful picture, and look like neither of their other children and like neither of themselves; or why hideous monsters sometimes appear to perplex and alarm and sadden the beautiful mother and the handsome and finely moulded father. We do know that frequently, when an ordinary mare has had a colt by a blood stallion, the owner is amazed by finding it full of defects. Often if he had inquired he would have found that her first colt was the offspring of a donkey or some poor treacherous and defective stud horse. Another thing is to take good healthy mares for breeders. A mare that has been used up, that has expended her energy and vitality in front of the lumber cart, will not produce very good colts, although sired by the best of stock. A fine working mare is all right, and fair labor does not injure her as a breeder. But take a mere rack of bones that has staggered and stumbled for years in front of a milk wagon, and you must not expect to raise a valuable colt from such a skeleton. Then, again, the colt when born should be well taken care of. For instance, take two colts from two mares of the same purity, and sired by the same father, and let one shiver out in the cold and storm; let him have such food as he can pick up among the rocks of a barren pasture, and such only, and let the other be handled about the farm, be fed freely from the stable door, be allowed to gallop in the sunshine, and gambol about the new and sweet pastures, and then after six months or a year compare them. The first will be a miserable pot-bellied runt, without pluck or beauty, and the other a fat, docile, sturdy and handsome fellow, head and tail erect, full of courage and full of intelligence. Now take two other colts of the same parentage and turn the fat one's brother out to get his own living, and take the lean one's brother to your home pasture and your stable and your oat barrel, and you will find that the brothers look like animals of different breeds, while the strangers look like brothers. Therefore pay attention to early feeding. As soon as a colt can eat, he should be fed liberally on a gruel made of ground oats and cows' milk. As he grows older give him unground oats without the milk, and feed him from a box of his own, not out of the sour manger where his mother has been fed. In summer let him run in the night and roll at his leisure and eat fresh grass, but when the heat begins to press carry him to the stable, and don't deny him his oats because he has eaten grass all night. The best trainers will not receive a horse into their training stables, whose oat fodder was neglected while a colt, and no other fare allowed him than the common pasture and stable hay. They say the mischief has already been done, and that it is useless to attempt to train an animal for extraordinary speed which has not been oat-fed from his birth.

As to breaking, if a colt is daily handled about the house door, and taught by his owner with gentle speech and patience, he will not need what is called "breaking," he only needs *teaching*. He is a kind and intelligent animal and wishes to do all that he can comprehend. With a careful mare and a patient teacher, he will usually go off the first time he is harnessed as steadily almost as an old stager.

One word with reference to stallions, as upon them it is a part of our duty to report. The nearer the stallion which you use is to the "thoroughbred," the better will be the offspring; the purer the blood the surer he will produce his characteristics in his progeny. We know of no pure "thoroughbred" in the State. There are some South, and their colts, of which some companies of Southern cavalry were formed, harassed our armies most unmercifully during the late rebellion. They are more perfect in England than in this country, by more judicious in-and-in breeding. The greatest cavalry charge of modern times was that of the famous "light brigade" at Balaclava. Those valiant men that galloped down with Lord Cardigan into the valley of death, all rode horses that were three-quarters thoroughbred, and each one cost three hundred pounds sterling.

It is not every one that knows what "thoroughbred," as used in this country means. Ours came from the thorough-bred of England, and England got them from the Desert of Arabia. They are the children of the Arabian horse improved in England. There are no trotters among them. They are all running horses. Well, we have none of these, but we have their *blood*, crossed to be sure, but bettered for all-work. The Morgan horses of Maine are part thoroughbred. The Black Hawks are part thoroughbred. The Messengers are part thoroughbred also. If you can have a stallion that comes from some Hambletonian mare, and so gives you the Messenger, and from a Black Hawk sire and so get the Morgan, which is part thoroughbred, you will have colts that will make the best horses of all-work, provided your mare is a good one.

A. D. MAKEPEACE, *Chairman.*

NANTUCKET.

From the Report of the Committee.

It is getting to be understood that the mare has very much to do with the quality of the offspring. There was a time when little scraggy, pot-bellied mares that had arrived at an age when they were nearly useless to labor were selected for raising the colts. While there was any work in them the owner could not spare them for this purpose. Now there is a better state of things. There were mares and colts presented this year that appeared in every way as well as the best specimens of other counties. To be sure, as in many other Massachusetts counties, there were no specimens of distinct breeds, but still there were those which combined enough of each of the famous kinds to make them very desirable for horses of "all-work." A practised eye could see most admirably mixed the good qualities of the Andalusian that ran away from his Spanish master while he was carousing in the halls of the Montezumas, the charger that escaped from the romantic expedition of De Soto, the warhorse that was stolen from General De Lancy at King's Bridge, and barb of the Moor and Arab. The horse now reared here is the product of Southern and Northern horses, Western and

Prairie, and probably every mixture mixed again that has been domesticated since the discovery by Columbus.

There is no reason why Nantucket should not make herself as famous for producing good horses as the Channel Islands have become for producing good cows. Careful attention to the selection of mares has more to do with it than in procuring the sires. The Arabs, for all our self-conceit, are at this day the best breeders of horses. With them we find more stress laid on a good mare than a good sire. A first-class mare cannot be bought of an Arab. He knows that there is scarcely a disease which is not inherited more frequently from the dam than the sire. For this reason the Arab shows the greatest care in selecting a mare, and the greatest attention to her offspring.

We hope the time will soon come when the professional horse-raiser will give his first and greatest attention to the stock he proposes to propagate; that he will make extended inquiries to find whether the mare he is about to select as a breeder is free from blemish, hereditary or acquired; that he will select none except such as are young and vigorous and have not been broken down by hard labor, of roomy form and good blood. This is of far more consequence than that the sire should be some fashionable, newspaper-puffed animal, with a long pedigree. For a road animal, the draught, the plough, use mares with the splinter or "heaves," or any other infirmity, for anything except breeding. Use them because they are tougher than a horse, less liable to injury, and will do more work on less feed. But for breeding purposes select the *very best.*

There is another thing which those we call barbarians have learned, which it will be profitable for us to follow. That is, that gentle treatment and intelligent using of the colt is all the *breaking* that is requisite. That not to *fear* man is one of the most important lessons that the young colt can acquire. By teaching him this and practising kindness invariably, we can get him to practise quite readily all that we now rend from him with the common "assault and battery" process.

EDWARD M. GARDNER, *Chairman.*

SHEEP.

HINGHAM.

From the Report of the Committee.

Sheep husbandry and the production of wool has become one of the largest and most valuable interests in this country. The United States, with their almost boundless territory, and numberless railroads connecting it with the markets, affords peculiar advantages for this branch of farming and promises a profitable field for future operation. Millions of acres of herbage, suited to the wants of fine-woolled sheep, are annually left to decay and waste for want of animals to consume the abundant spontaneous growth, and millions of dollars are thereby lost to the country. It is true that the markets have lately been overstocked with wool, and the farmers have suffered much less in their flocks from disease and otherwise; but as the railroads build up the country and open communication with the vast fields of the West and South, the raising of sheep will become more and more profitable, and be a source of infinite wealth to the people. Our pastures are limitless, and yet we have to-day less than half the number of sheep in Great Britain, our last returns showing about twenty-five million as against fifty-five million in Great Britain. This arises, of course, from the nature of the country and the vast tracts of land as yet unexplored, and hence unimproved.

We do not expect in Massachusetts, however, large or very profitable returns from the rearing of sheep. In a State so densely populated, with so many small farms, and the people so extensively engaged in manufacturing and commercial pursuits, the farmers can hardly hope to compete with the farmers of the newer States, at least in the production of wool. The farmer of Hingham, with his cosset tethered at his back door, or even his flock of one hundred sheep, can hardly expect to undersell the Texan herdsman with his ranch of fifteen thousand acres and as many sheep upon it, even if he is nearer the market. Wool can probably be produced in Texas and shipped to market at half the cost that it can in Massachusetts, and at the present market prices the raising of sheep for wool would hardly be economical.

Nevertheless, we shall find the keeping of sheep profitable; and it is to be encouraged for the production of mutton as a direct means of support, and indirectly for maintaining the productions of the soil. Although the mutton in our market comes principally from Canada and the West, and very little, if any, from the country within one hundred miles of Boston, yet we can find a ready sale for all we can raise for home consumption. We can at least help to supply our own tables. A flock of sheep, too, is as beneficial to the pastures of a large farm as the pruning knife is to the orchards or the broom to the kitchen. They will effectually clear up the weeds, briers, bushes and other rubbish, thereby saving the farmer much labor with the bush-scythe, and by their droppings prepare the field for the plough. It is for these purposes, for raising mutton and for clearing up our old farms, many of which are becoming foul, and possibly for the exportation of full-blood sheep, particularly bucks, that the farmers in this immediate vicinity should engage in the raising of sheep.

It is useless, and indeed impossible, to say which is the *best breed* of sheep, it depends so much upon the purpose for which they are kept, whether for mutton or for wool, and upon the local condition of the country where they are reared, its proximity to market and the character of the lands for feed, some breeds thriving best in one country and some in another, and some being best for mutton and some for wool. No single breed has yet been found which combines both these qualities in the *greatest* perfection. The best breeds for wool seem to be found in the Middle and Southern States, and the best for mutton in the Northern and Western States. For the large, rough tracts of rocky pastures in the unsettled States and Territories, far away from the markets of the world, where the sheep can be herded together by thousands and turned out to take care of themselves to a great extent, the small, hardy Merino sheep or the South Downs are best adapted; being small and tough, they more easily find their way over the rough pastures, earn their own livelihood and produce a large amount of fine wool for their size. The Cotswolds and Leicesters being of larger frame and requiring more food, cannot so well be herded in large flocks nor find their own support, and are therefore better suited to the richer land and smaller farms in the more populous countries, where more attention can be given to them and the mutton at once turned into the markets.

For the farmer in Hingham, the Merino sheep would not be economical, being valuable chiefly for their fine wool. The South Downs, on the contrary, could be reared with profit for the fine quality of mutton they produce, and for the improvement of our home stock, and for exportation, as well as for their fine wool. The Leicesters, with their heavier fleece and carcass, combine, as much as any single breed, the advantages of wool and mutton, and would, no doubt, be a good breed for the farmers in this neighborhood to raise. The later importations into this country, the long-woolled Cotswolds and Cheviots, have each their respective merits, and are valuable, but our experience with these breeds is as yet more limited. Theoretically, we should of course cultivate the pure bloods, but for general purposes *in this market*, for the size of the lambs dropped, and the weight of the fleeces sheared, both taken into consideration, a flock of Canada sheep will yield perhaps the largest *pecuniary* returns to the farmer to-day. And it is with this view that the Committee this year, as in years past, have awarded the premiums. Believing fully in the merits of the South Down breed, they find that, as a means of support to the Hingham farmer, more profit can be made from a flock of Canada sheep than from a flock of pure South Downs. The experience of many, however, has proved that the most profit can be realized from a flock of Canada sheep, crossed by a full-blood South Down buck.

Whatever breed we keep, there can at least be no excuse for neglect in the management and care of the animals themselves. Our pastures are all near home, and afford good feed in ordinary seasons; our flocks are small, and each animal can receive our individual attention if necessary; if we lose one, we can easily leave the ninety and nine in the wilderness, and go after that which is lost, until we find it. All our sheep therefore should be in good condition. It is true, we cannot protect them entirely from the ravages of dogs, which in some parts of the country have been so extensive. It has been estimated that throughout the United States we annually suffer a loss of two million sheep killed in this way, and one million wounded. Still we can do much by the enforcement of stringent protective laws.

In winter and spring, as well as in summer, the sheep deserve our attention. Give them good dry barns or sheds, with plenty of room, sunlight and ventilation, and a variety of food in the winter; wash them early in the season, in a stream of running water, if possible, and shear them from a week to ten days afterwards.

We recommend the pursuit of this branch of husbandry, both as a source of income and of pleasure. What more useful animals to reclaim our old pastures, what more beautiful animals to grace them, once reclaimed? How could the commissioners of the Central Park in the great city of New York have better enriched the beautiful lawns than by the flocks of South Downs which graze upon them? How can we better add to the profit and beauty of our own farms than by the flocks which feed upon their hillsides?

It is gratifying to note the increasing interest manifested in this neighborhood in the raising of sheep, and it is becoming this society to further the efforts of the farmers in this direction in every proper way.

ARTHUR LINCOLN, *Chairman.*

POULTRY.

MIDDLESEX NORTH.

From the Report of the Committee.

Something was said last year regarding the construction of coops; we noticed some improvement, but they were hardly up to the mark this year. At the New Hampshire State Fair, we noticed that a majority were made after the following manner: Make of matched boards two squares exactly alike of the required size; around the outside nail on pieces four inches wide, run a gauge mark through the centre of the pieces, and bore three-quarter holes, three inches apart, all around on this mark. Get a quantity of stair rounds, and saw them as long as the required height; insert the ends in these holes, tack with small nails, and you have a handsome, cheap and durable article.

A few words, regarding the status of the poultry business, we think may be of interest.

Since the advent of the long, gaunt, ungainly Shanghai into this country, there have been imported between sixty and seventy varieties of hens, eight varieties of turkeys, nine of geese and seven of ducks, for which premiums have been offered by the various societies in this interest; yet with all this improvement in breed, not one particle of real statistical information regarding their exact paying value exists. This is in part owing to the fact that, before importation, little interest was taken in fowls outside of the supply of home wants, and that since then, fanciers have seized upon every fresh arrival to propagate for fancy.

It is time now that we should ascertain the true market value of some of these fine birds, that we may know which to select for permanent keeping. In furtherance of this object, we wish five or six interested gentlemen, selecting different breeds, would open with them a strict business account for two years, reporting at the end of that time to this society, charging them with first cost, hen-house and all other appliances, food, and interest on money invested; contra with eggs, poultry, manure, value of stock and fixtures on hand at the end of the account.

We warrant this experiment to pay in pleasure, and think without doubt the balance in money will be on the right side. In order to give it its full value, home breeds should be selected and kept entirely distinct, because all mixtures deteriorate. We propose on our part to take eight or twelve white Leghorns, and an equal number of light Brahmas, that we may test their value, both for poultry and eggs, and at the end of two years, we may have no doubt, we shall be able to say confidently, our hens pay.

A. G. SWAN, *Chairman.*

WORCESTER NORTH.

From the Report of the Committee.

It has been demonstrated, over and over again, that no animals kept upon the farm are capable of yielding so great a return, upon the capital employed, as poultry.

The writer has invariably found, from actual recorded results, that there has never been less than one hundred per cent. profit realized upon the capital involved; and it has often gone as high as one hundred and fifty or more. Of what other stock kept can such a result be shown? Although this state of things is freely admitted, yet there is a very general feeling that it is a small business, can only be pursued on a small scale, and will do for women, children, and a class of men whose time has but a limited value. There is also a very prevalent sentiment that poultry in any considerable numbers cannot be kept upon one farm, and therefore the subject is unworthy of serious attention.

It is quite true that poultry in large numbers together have never permanently succeeded; but it is also a fact that a family of say a dozen in number can be kept in perfect condition, and with profitable results, while partially or entirely confined to a movable or even a stationary coop. This is frequently to be seen in villages, where the fowls are necessarily kept from ranging at all. If a single dozen of fowls will succeed under such circumstances, there is no plausible reason that can be urged why another dozen cannot be kept at a small distance, and still another, and so on indefinitely; the only question to be determined being the smallest space to which each family can be limited, and entire success follow. To make the keeping of a dozen or a score of hens a satisfactory operation under these conditions, we must become familiar with their habits and requirements. A few hens running at large over a farm, will get a fair living with little or no feeding, but will not yield the best results. There are two great essentials so far as their food is concerned. One is that they shall have all that they can consume in quantity, and the other is that they shall have a variety sufficient to supply all their needs. It is evident that if they are to be confined to a larger or smaller space, it is feasible to supply them with food in unlimited quantities, and that it is entirely possible to give them all the variety necessary, if we only know what that is. The failures in feeding almost always grow out of the failure to supply an adequate variety, rather than a sufficient quantity.

A hen should be looked upon as an egg-factory, or as a machine for producing eggs. If the machine is in a proper state of repair (*i. e.*, if the hen is in good health), then the more raw material, of which eggs are made up, that the machine can be made to consume, the greater will be the production of the manufactured eggs. If a hen requires three ounces of grain per day to keep her in condition simply, without increase in any respect, then it follows that unless she can get more than three ounces, she can never produce an egg except at the expense of her own substance. Hence all the profit must come from the excess of the three ounces that are furnished and consumed. For this reason, every expedient that does not interfere with the health of the animal should be made use of to induce her to consume all the raw material possible out of which eggs are formed. The appetite of fowls is not always a sure guide in these cases. Perhaps there is nothing that they will eat with greater avidity and apparent relish than hot boiled potatoes, and yet if they are supplied with all that they will consume, it will surely diminish and even stop the production of eggs. This is also true of some other kinds of food.

As far as our experience has taught us, up to the present time, their requirements for the largest production of eggs would be best supplied as follows:—

1st. An unlimited supply of good wheat. It is very common to use the cheaper grains, and especially wheat screenings, for this purpose, but we are convinced that a given amount of money invested in first quality grain will yield a larger return in eggs than if anything inferior is substituted.

2d. An unlimited supply of sound corn. The same principle will apply here as regards inferior corn. It is also a fact that a hen will consume less of second quality corn, if it is poorly ripened, or has been injured by heating or otherwise; and this, in addition to its poorer quality, at once tells against the production of eggs.

3d. A limited amount of animal food. This may be provided in the form of fresh meat or fish, better if cooked, beef or pork scrap-cake, ground; or, what we have found to be a very good substitute, skim-milk curd, freed from whey. This last we supply to them without limit, as there is no risk of their consuming it in injurious amounts, as they sometimes will fresh meat.

4th. Some form of vegetable fibre. Hens consume large quantities of clover and grass during the summer season, if they have access to it; and in fact when it is often supposed from their motions that they are feeding upon insects, it is only upon the leaves and blades of the grasses and clovers. In confinement a very good substitute may be found in dry shorts, which they will eat very freely.

5th. Lime. This may be fed in the condition of egg-shell, ground oyster shell, bones, or old mortar.

6th. Gravel stones. When confined, it will be necessary to give them a supply of gravel, or, in winter, we have found a good substitute in pounded anthracite coal, or the unburned bits of coal left in the ashes. Dry coal-ash is also one of the best absorbents of their droppings. An inch or two spread upon the floor of their house will keep everything dry and sweet for a long time. It will also afford a very good dusting material, that will be of great service in keeping them free from vermin, one of the most essential things in the whole management.

For the best results, chickens should be hatched so early in spring that the pullets will commence laying in September or October, and they ought not to be kept more than about a year from that time, as the number of eggs laid the second year will be slightly less than the first, and less of them will be laid in the time of the highest prices.

Jabez Fisher, *Chairman.*

BRISTOL.

From the Report of the Committee.

Considerable inquiry was made of the Committee to know some of the most useful breeds to keep. The Committee take the liberty to recommend the following: Light and dark Brahmas, Plymouth Rock, Buff Cochins, Dorkings, Game, White Cochins, Dominique, Chittagongs and White Leghorns. In making these recommendations we do not lose sight of the fact that this is an agricultural and not a poultry-fanciers' society. There are many breeds of great beauty and value to the fancier which are not profitable to the farmer. Farmers and others who raise poultry will find it to their advantage to keep pure breeds, because they will bring larger prices when they arrive at maturity, and the actual cost is no more.

Let every member of our society who may have a farm or garden contribute a coop of poultry, and it will surpass any poultry exhibition ever held in this country.

Your Committee recommend that at the next annual exhibition contributors make a statement of the cost and income of some of the leading varieties.

Considerable having been written in former reports about the best breeds of poultry, we take the liberty this year to make the following suggestions in regard to the management of poultry.

In locating a hen-house select a southerly aspect, that the hens may enjoy the sunshine in cold weather. Make the house so that it can be well ventilated in warm weather and be warm in cold weather. It should be well lighted, and so arranged as to admit plenty of air in the summer. A house may be built in the south side of a bank or hill, in a dry location.

Hens that are kept to lay should be fed well, but not overfed. Give them oats, barley, buckwheat and Indian corn. Give them boiled potatoes, mashed while hot; stir in wheat bran and barley meal. This makes the very best feed for chickens. In winter keep constantly by them old mortar, ground oyster shells and ashes. Feed green food, such as cabbage, potatoes and turnips, and you will have plenty of eggs.

The croup is one of the most destructive of diseases that attacks the feathered family, and generally by being closely confined in damp houses and improper care. Allow chickens pure air, pure food and pure water, and they will be seldom sick. By all means whitewash the hen-house in the spring and fall. Put much salt in the whitewash, fill all the cracks with the wash, and all trouble from vermin will be gone.

Turkeys in bad weather should have a dry shelter; a dampness is destructive to them. The curd of milk and hard-boiled eggs are very good. Indian meal may be given after they are a few weeks old, and boiled potatoes mixed with shorts and meal are very good food. They are great ramblers, and cannot well bear confinement. In good weather they do better to let them range in the air and seek their food. Turkeys will thrive best in warm, dry seasons.

Ducks should have clean, pure water—not a mud hole—to swim in; a running brook is best. If that cannot be had, make a little artificial pond. It can be done with little expense.

Scoop out the earth the shape of a basin, and cement it two inches thick, and the pond in made. Some breeders do not let them go into the water, having only a little to drink, but pure water will not hurt them. Barley and Indian meal mixed with scraps is very good food and will fatten them very early.

Geese, the same as all other poultry when young, should be kept warm. They do not require much water. They are raised on the Western prairies very successfully, with only a little to drink. They thrive very well in a good pasture in the summer, without any other feed.

Some farmers and others commence with a very fine stock of poultry and in a very few years they are a sorry looking mess. Among the most prominent reasons for this is breeding in a hap-hazard manner, without any regard to breeding from the best, breeding in and in (this should not be done more than one year), want of good keeping, want of good management, and excessive use of the male bird. Bad keeping, want of pure water, exposures, bad management of any kind, are causes of degeneracy. To improve poultry they must be well but not too highly fed, well watered, and managed every way for the promotion of their health and comfort.

JOSEPH R. PRESHO, *Chairman.*

BRISTOL CENTRAL.

From the Report of the Committee.

We would again call the attention of exhibitors to the necessity of having proper coops or cages. Some of these were really disgraceful, and we think if they had been exhibited in New York, the president of the society for the prevention of cruelty to animals (Mr. Bergh) would have been justified in entering a complaint. It requires but a small expenditure of time, money or ingenuity to construct a coop which will comfortably hold and exhibit the birds which it contains. It may be said that in the country lumber is often difficult to be obtained, but some of the coops had slats so broad that two coops might have been made from the material wasted in constructing one poor abortion, so miserable that it was cruelty to keep fowls shut up in it for forty-eight hours.

On the other hand, the Committee would speak in words of warm commendation of many admirably constructed cages, exhibited by Isaac Dean of Taunton, John Cummings, Jr., Frederic S. Potter of North Dartmouth, R. G. Buffinton of Somerset, and others, to whom we would gladly have voted more premiums, if the sum appropriated to this department had warranted it. We hope by another year to have at least twenty-five cages owned by the society, into which, for a small compensation, birds badly accommodated by their owners can be placed. In former years, it has been a subject of complaint that this attractive department was crowded too much in a corner, far away from the portion of our grounds most thronged and accessible. The Committee, this year, availed themselves of a new and better location, much nearer the centre of the grounds, and from the approbation expressed by many at the change, as well as the increased throng of interested spectators, they are led to believe that future exhibitions should be located in nearly the same spot.

Another new feature of the exhibition was the entry among the lists of competitors in this department of a young lady,—Miss Eudora F. Terry, of New Bedford,—who made a most gratifying and brilliant display of light and dark Brahmas, golden buff Cochins, Houdans and Gray Dorkings. We welcome this fact as a very encouraging indication that the refined and intelligent culture of choice breeds of poultry is beginning to be appreciated by those whose natural susceptibility to beauty is usually of a finer quality than our own, and who are not likely to be excelled in the breeding to a feather of our choicest breeds of poultry.

We hope another year to chronicle the advent of other lady competitors. We can assure them that in this specialty there is great scope for the exercise of æsthetic perceptions. What can be more beautiful, for instance, than the pencilling of the gold and silver Hamburgs; the exquisite harmony of color which the best-bred Gray Dorking pullets exhibit, and which we think come nearer the wild game birds of the country in beauty of form and plumage than any other?

Then there are the numerous strains of game fowl, the *preux chevaliers* of their race, unexcelled in splendor of plumage and unequalled in grace of form and carriage: the Houdans, helmeted like cuirassiers, and the plumed Crevecœurs, the *black-*

horse cavalry of the poultry yard; the La Fleche with its branching antlers, and the black Spanish and Leghorns, whose battlemented combs of the brightest crimson, flaming above the raven and snow of their plumage, entitle them to be considered the *color guard* of the grand poultry army. Then there are the stately Brahmas and Cochins, the giants of their race; the black Polands with their crowns of snow, and their golden and silver cousins beautifully marked; and last come the sprightly little Bantams, whose pencillings have made immortal the name of Sir John Sebright, and whose tints are almost as various as the wild flowers of spring. Is there not a field here sufficient to tempt the most æsthetic taste?

We are glad to perceive that the Houdans are growing more numerous at our annual exhibitions. From the universal testimony in their favor, as well as from our own experience, we consider this the most valuable of the late importations, and we hope to see them very extensively introduced. Four hens belonging to the Chairman of your Committee commenced laying about the first of January, and with hardly any intermission in the coldest weather, continued to lay until the last of July, when they began so moult.

Their eggs are of large size, and if these were sold by weight, as they ought to be, this would be a strong point in their favor. The young are very hardy and mature rapidly. There is probably no breed better adapted to the generality of farmers. They seldom show a disposition to set, and on that account, if chickens are desired, it is necessary to have hens of the Game, Dorking or other breeds to rear the young. The Gray Dorking, we are also pleased to see, is growing into favor. The only fowls of this breed in good feather were those of Mr. Isaac Dean of Taunton, whose coops attracted great attention.

The coops of Black Spanish fowls exhibited by Mr. Cummings of North Dartmouth were very superior, showing that they had been most carefully bred.

Never before within our recollection has there been such a fine show of thoroughbred fowls, and this is particularly gratifying when we remember the very poor mongrel varieties formerly exhibited by individuals, who now bring every year coops of the choicest fowl showing thorough breeding.

We cannot forbear congratulating the society upon the fact that the quality of our annual shows in poultry has advanced nearly *one hundred per cent.* since our first acquaintance with them a few years since; a fact which proves that our farmers are becoming more and more alive to the profit as well as pleasure to be derived from an intelligent cultivation of this interesting branch of rural economy. The amount expended in premiums is already far more than compensated for by the increased attractiveness of our annual displays,—less startling because very gradual from year to year; and we have no doubt that if a census could be taken, the value of eggs and poultry raised in Bristol County would be found to have increased at least forty per cent. within the last ten years. We do not form this opinion altogether from our annual exhibitions, but from frequent excursions over a large section of the country during the last two or three years. The Brahmas may now be considered the common fowl of the country; a breed which is an admirable one for all farmers who wish to raise a handsome flock of chickens without much trouble, as the young ones hatched are almost certain to live. Next to these, the Leghorns seem to be the favorites. We hope in a few years to see Houdans and Gray Dorkings as numerous as the Brahmas, though the latter is a most valuable breed, and we hope it will continue to be bred pure.

In our report of last year, some general remarks and statistics were given with regard to poultry raising. We have received a little statement, which we insert here for the purpose of showing what we then stated, that the raising of poultry could be made as profitable as any other branch of agriculture. The following is the statement of Dr. Justin Prior, of Orange, N. J.: "On January 1st, 1870, we had on hand sixty-three fowls, consisting of five Brahma cocks, twenty-four Brahma hens, twenty-one Leghorn hens, two Chittagong hens, one Poland hen, five common hens, two Silver Hamburg hens, two ducks, one drake.

From January 1st, 1870, to August 1st, 1870, we have received for eggs and poultry, ...	$199 80
Amount paid out for feed and sundries, . . .	54 82
Leaving a profit of	$144 98

We have now on hand fifty-five fowls, having lost by sickness fifteen fowls during the summer."

Mr. Prior states that his land is very low, and is not a good location for raising chickens, which accounts for the unusual mortality. Under favorable circumstances, he would have had at the close of the season quite as many as he started with. He states, in addition, that his hen-house, coops, &c., cost forty-three dollars, and were paid for out of his last year's profits, and since sold for fifty dollars.

It is evident that there is a profit here of at least one hundred per cent., which we think is as great as can be realized from any other department of farming. It would be gratifying to your Committee if breeders of poultry would furnish them with statements like the above.

EDMUND RODMAN, *Chairman.*

THE DAIRY.

BERKSHIRE.

From the Report of the Committee.

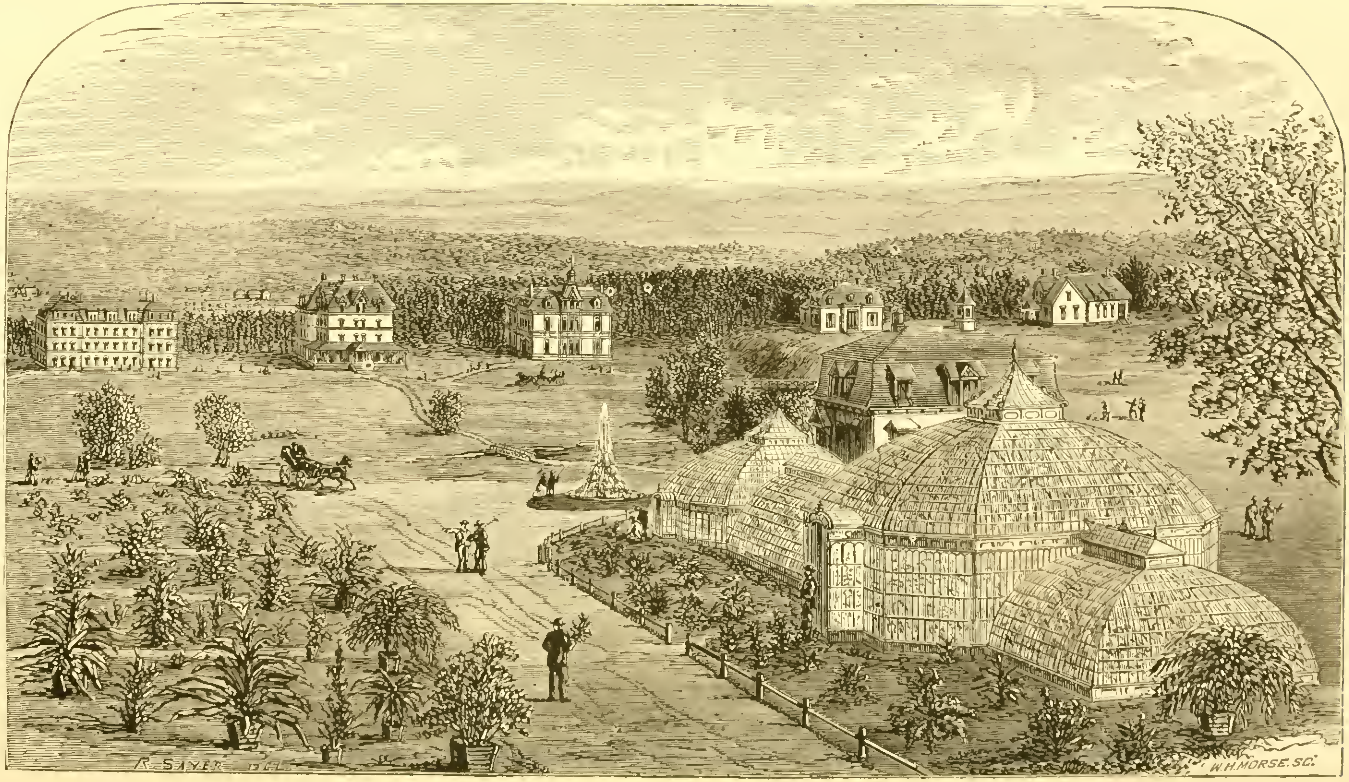
It is an established fact that the milk of some cows is deficient in one or more properties that are requisite to make sweet and delicious butter, though they may give a large flow of milk and rank number one in the cheese department. I will here simply state that in former years our occupation was what we termed a practical farmer's and dairyman's, and give our system of making butter. First, and not least, cleanliness in all things relative to our vocation should be strictly observed, for without this necessary precaution you cannot make a good article. In warm weather fill the pans about two-thirds full of milk and set them in a cool milk-room. Place them in a vat or sink about six inches deep, then let a stream of cool water in until it stands two or three inches deep in the sink and around the pans; let them remain until the sink or vat is wanted for the succeeding milking; then remove the pans to shelves and let them stand for thirty-six hours from the time of filling. (I know some will demur to this theory, and would prefer good fresh cool air. I am not writing from theory or a wide stretch of imagination, but from actual experience.) Adopt this course only in extremely warm weather. In the spring and early fall omit the flow of water around the pans.

In cold weather place the pans on the stove or furnace, and heat until the cream becomes waved or crinkled, then set them away for twelve to twenty-four hours, according to the atmosphere of the room, then repeat the heating process as before. Skim and keep the cream in stone jars, as they are preferable to wood ; let the cream at every addition be well stirred, that it may be wholly mixed. Churn every other day in warm weather, and twice a week in cold. If the atmosphere is excessively warm after the cream is in the churn, put in a few small lumps of ice. Let the revolutions of the dasher be uniform ; when the globules are broken, and the butter appears in particles and commences to separate from the buttermilk, put in two quarts or more, according to the amount of butter, of water ; then move the dasher moderately for two or three minutes or until the whole adheres in one lump. Draw off the buttermilk and turn in half a pail of cool water ; move the dasher slowly for a few minutes to work out the buttermilk, then draw off the water, and take the butter into the bowl or tray and put one ounce of salt to each pound of butter ; work it in carefully, so as not to break the grain of the butter more than is actually necessary. Let it remain for twelve hours, that the whole may become completely incorporated, then give it the second working, extracting all the buttermilk, and pack in stone jars. If to be kept any length of time, cover the surface with a brine made from pure salt.

Butter will keep the sweetest in its natural color, as any coloring matter will have a tendency to destroy that sweet, delicious and peculiar flavor that is palatable to all butter-eaters of fine, susceptible tastes. This was our system ; not that I wish to be understood that we made a better article than many others, but I will say that our butter was eagerly sought after by those who had tested its flavor. There is, however, one point in making good butter that seems to be overlooked, that is, the influence of the food consumed by the cow upon the milk she produces. And here rests a large proportion of the secret of making good or poor butter. It is a matter worthy of and demands a very close investigation. The most natural food of the cow is grass; therefore, according to the quality of her feed, so to a greater or less extent will be her milk. What is most desirable in a pasture is a variety of grasses of fine, sweet, nutritious quality and a constant succession of growth. It is the noxious weeds, &c., that cows eat, which impart bad flavors, and the sweet, nutritious food eaten which imparts that beautifully rich taste peculiar to prime, fresh butter.

For the fall and winter months, let there be given a liberal allowance of sweet, fine hay, cut before the seed is developed, with a certain allowance of shorts, together with roots. Rye and oats ground together will make more milk than shorts or meal, though the two latter mixed make richer milk. Some butter-makers assert that cream should be kept unil it becomes sour before you churn it or can make good butter from it. From that theory I shall most emphatically differ. For evidence, I will here state a case during our experience in the dairy business. Our churning for a time was done by water-power, and we frequently would take the milk warm from the cows and churn it (which would usually take about five minutes), and I have yet to find that sweet, delicious flavored butter, from sour cream or any other, that we used to get from that sweet milk; from which it is evident that the sweeter the cream the sweeter the butter made therefrom.

MILES AVERY, *Chairman.*


R. SAYER DEL.
W.H.MORSE.SC.

DURFEE PLANT HOUSE, AT THE MASSACHUSETTS AGRICULTURAL COLLEGE.

SUPPLEMENT.

MASSACHUSETTS AGRICULTURAL COLLEGE.

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CALVIN CUTTER, M.D.,
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* Deceased.

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PROF. WM. R. WARE, B.S.,
Lecturer on Architecture and its Application to Rural Affairs.

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Professor of Vocal Music.

JOHN GRIFFIN, GARDENER.

JOHN C. DILLON, FARM SUPERINTENDENT.

Summary of Students.

Seniors,	30
Juniors,	34
Sophomores,	27
Freshmen,	32
Select,	22
Resident Graduates,	2
Total,	147

COURSE OF STUDY AND INSTRUCTION.

Freshman Year.

First Term.—Recitations in Human Anatomy and Physiology; Chemical Physics; and Commercial Arithmetic and Book-keeping. Lectures on Agriculture: *first*, its importance as an Art, and its relations to other pursuits; *secondly*, as a Profession, and the education it requires; and *thirdly*, of Soils, their origin, varieties, and composition. Lectures on the properties of Matter and the nature and effects of the forces, Heat, Light, and Electricity. Lectures on the Laws of Health. Instruction in Elocution; and in Penmanship, and Orthography, for such as are deficient in these branches. Military Drill; Infantry Tactics; School of the Soldier.

Second Term.—Recitations in Chemistry; and Algebra; Lectures on Agriculture; Improvement of Soils by chemical and mechanical means; Drainage; Irrigation; Tillage; Implements for, and methods of stirring and pulverizing the soil and subsoil. Lectures on the Chemistry of the Non-metallic Elements; the principles of Chemical Philosophy; the most important Metals and their uses in the Arts. Instruction in Elocution; Vocal Music; and English Composition. Military Drill; Infantry Tactics; School of the Company, and Manual of Arms.

Third Term.—Recitations in Algebra and Geometry; and French. Lectures on Agriculture; Sterility of Soils, its causes and remedies; Rotation of Crops. Lectures on Organic Chemistry; Instruction in the Laboratory in Analytical Chemistry. Instruction in Elocution, and Reading. Military Drill: Infantry Tactics; Schools of the Company and Battalion.

Sophomore Year.

First Term.—Recitations in French, with written exercises; Zoölogy; Geometry and Conic Sections. Lectures on Agriculture; Mineral Fertilizers; Organic Fertilizers; Animal Manure, its origin, varieties, value, and treatment; Waste of Fertilizers; Absorbents of liquid Manures: Composts; Application of Fertilizers. Lectures on Agricultural Chemistry; Instructions in the Laboratory in Practical Chemistry. Exercises in Declamation; and French Translation. Military Drill: Infantry Tactics; Manual of the Bayonet, and Instruction in duty as Skirmishers.

Second Term.—Recitations in French; Logarithms, Plane and Spherical Trigonometry, and Measurement of Lines, Surfaces, and Volumes. Lectures on Agriculture; Economy in the treatment and use of Soils, Manures, Crops, Teams, Laborers, Live Stock, Implements, Fences, and Buildings. Lectures on Quantitative Analysis, and Practice in the Chemical Laboratory. Exercises in Declamation; and Vocal Music. Military Drill: Infantry Tactics; Bayonet Exercise.

Third Term.—Recitations in History; and Surveying, with Practical Land Surveying, Plotting, and Geometrical Drawing. Lectures on Agriculture; Farm Management; Selection of Lands. Division into mowing, arable, pasture, and woodland; Roads; Fences; Buildings; System to be adopted;

Plans for each year; Cultivation and use of the various crops; Sources of profit in General Farming; Special Farming. Lectures on the Diseases of Domestic Animals; General Pathology; Fevers and Inflammation and their consequences; Glanders and Farcy; Diseases of Respiratory and Circulatory Organs; Diseases of Digestive Organs; Urinary and Generative Organs; Castration; Parturition and rules for assisting parturient animals; Diseases of Udder and Teats; Affections of the Nervous System; of the Eye; of the Skin; the Foot; Method of Shoeing; Wounds; Ulcers; Sprains; Diseases of the Bones and Joints; Dislocations and Fractures. Exercises in Reading; and Practice in Writing Sentences on the Blackboard. Military Drill: Infantry Tactics; Skirmish and Battalion Drill; Guard Duty; and Forms of Parade and Review.

JUNIOR YEAR.

First Term.—Recitations in German; Mechanics of Solids and Liquids; and Physical Geography. Lectures on Agriculture; Market Gardening, including Small Fruits. Lectures on Useful and Injurious Insects. Instruction in Practical Leveling, and Topographical Drawing. Exercises in Reading Shakespeare. Military Drill: Artillery Tactics; School of the Piece.

Second Term.—Recitations in Mechanics of Air and Steam; Sound; Light; Heat; Electricity; German; and Structural Botany. Lectures on the Construction and Management of Plant-houses, and the Cultivation of Plants under glass. Lectures on Mechanics, and Statical Electricity. Instruction in Free-hand Drawing; Perspective; and Shades and Shadows. Exercises in Agricultural Discussion; and Vocal Music. Military Drill: Artillery and Cavalry Tactics; Manual of the Sabre; School of the Trooper dismounted; Instruction in Heavy Artillery Tactics and Gunnery.

Third Term.—Recitations in Astronomy; Systematic Botany; and German. Lectures on Milch Cows, and Dairy Farming. Lectures on Stock Farming, and the Breeding of Domestic Animals. Lectures on Physics; and Comparative Anatomy. Exercises in Debate. Military Drill: Artillery Tactics; School of the Section; Infantry Tactics; Battalion Drill.

SENIOR YEAR.

First Term.—Recitations in Mental Science; Rhetoric; and Civil Engineering for the Farm. Lectures on English Literature. Lectures on the Cultivation of Fruits and Flowers, and the art of producing new varieties. Instruction in Mechanical and Architectural Drawing; and in preparing Working Plans and Specifications. Exercises in Original Declamation. Military Drill: Cavalry, Artillery, and Infantry Tactics; Duty as Drill Masters and Officers in Infantry and Artillery Drill; Theoretical Instruction in Cavalry Tactics, and the organization and uses of Cavalry.

Second Term.—Recitations in Moral Science; Political Science and Economy; and English Literature. Lectures on Rural Law, including the Rights and Obligations of Landholders. Lectures on Arboriculture; the planting and care of Trees for the production of Fuel, Timber, Fruit, or for other purposes. Lectures on Military History; Military Law; and Courts-martial. Exercises in Original Declamation. Military Drill: Cavalry Tactics; Sabre Exercise.

Third Term.—Recitations in Landscape Gardening; Geology; and General Reviews. Lectures on Agricultural Botany. Lectures on Architecture, with special reference to Rural Affairs. Lectures on Mineralogy, and Geology; Meteorology; and Civil Polity. Exercises in Original Declamation. Military Drill: Target Practice; Sword Play; and General Drill.

Practice in the various operations of the Farm and Garden through the course.

SELECT COURSE.

Those who do not intend to pursue the full course, may select from the studies of the first, second, or third terms of any year in the curriculum, such instruction as they choose, provided they are qualified for it.

CALENDAR FOR 1871.

The second term of the collegiate year begins January 19, and continues till April 19.

The third term begins April 27, and continues till July 19.

The first term begins August 31, and continues till the Wednesday before Thanksgiving.

There is an Examination of candidates for admission to the College, at the Botanic Museum, at 9, A. M., Tuesday, July 18, and also on Thursday, August 31.

The annual Public Examinations, and the Prize Declamations take place Monday, July 17.

The Exercises of Class Day, and the Address before the Literary Societies, on Tuesday, July 18.

The Exercises of Graduation Day, with the conferring of Degrees by His Excellency Governor Claflin, and an Historical Address, by Hon. Marshall P. Wilder, on Wednesday, July 19.

ADMISSION.

Candidates for admission to the Freshman class, are examined in writing, upon the following subjects: English Grammar, Geography, Arithmetic, and the History of the United States.

Candidates for higher standing, are examined as above, and also in the studies gone over by the class to which they may desire admission.

No one can be admitted to the College until he is fifteen years of age, and every student is required to furnish a certificate of good character from his late pastor or teacher, and to give security for the prompt payment of term bills. Tuition and room-rent must be paid in advance at the beginning of each term; and bills for board, fuel, and washing, at the end of every term.

The regular examinations for admission are held at the Botanic Museum at 9 o'clock, A. M., on Tuesday, July 18, and on Thursday, August 31; but candidates may be examined and admitted at any other time in the year.

Further information may be obtained from President W. S. Clark, Amherst, Mass.

EXPENSES.

Tuition,	$18 00	per term.
Room rent,	5 00	"
Incidental expenses,	1 00	"
Board,	3 50	per week.
Washing,	50	per dozen.
Expenses of Chemical Laboratory to students of practical Chemistry,	5 00	per term.
Public and private damages, including value of chemical apparatus injured or destroyed,	at cost.	
Annual expenses, including books,	$250.00 to $300.00	

REMARKS.

The full course of study occupies four years, and those who complete it receive the degree of Bachelor of Science.

The instruction in the languages is intended to qualify the graduates to write and speak English with correctness and effect, and to translate French and German with facility. The scientific course is extensive and thorough, and as practical as possible. Every student has the opportunity of becoming a good chemist, a skillful surveyor, and a civil engineer. At the same time, every science is taught with constant reference to its applications to agriculture and the wants of the farmer.

The instruction in agriculture and horticulture, includes every branch of farming and gardening which is practiced in Massachusetts, and is both theoretical and practical. Every topic is discussed thoroughly in the lecture-room, and again in the plant-house or the field, where every student is obliged to labor. The amount of required work, however, is limited to six hours per week, in order that it may not interfere with study. Students are allowed to do as much as they please, provided they maintain the necessary rank as scholars. All labor is paid at the rate of from ten to twenty cents per hour, according to its value.

There is no provision for indigent students, beyond the opportunity to do such work as may offer about the college and farm buildings, or in the field, and it is hardly possible to earn more than from fifty to one hundred dollars per annum, besides performing other duties. So far as is consistent with circumstances, students will be permitted to select such varieties of labor as they may for special reasons desire to engage in.

Those who pursue a select course attend recitations and lectures with the regular classes; but persons, properly qualified and desiring special instruction in chemistry, civil engineering, agriculture, or horticulture, may make private arrangements with the officers having charge of these departments.

An expenditure of from ten to fifty dollars is necessary to provide furniture, which may be purchased at reasonable rates, either new or second-hand, and re-sold upon leaving, if desirable.

On Sunday, students are expected to attend the chapel service and Bible-class, which are conducted by the professor of moral science. While the

Bible is made the basis of all religious instruction, everything of a denominational character is as far as practicable avoided.

Students may, upon the written request of their parents or guardians, be excused from these exercises to attend services in one of the churches of the village.

BOOKS, APPARATUS, AND SPECIMENS IN NATURAL HISTORY.

The Library of the College contains about one thousand volumes. Among them are several valuable sets of cyclopædias, magazines and newspapers, reports of Agricultural Societies, and State Boards of Agriculture, and many standard works on Agriculture and Horticulture. There are also many excellent works of reference in Chemistry, Botany, Surveying and Drawing. The larger part of the books have been presented to the Institution by private individuals.

The faculty and students of the College also have access to the Library of Amherst College, which contains nearly thirty thousand volumes.

The State Cabinet of Specimens illustrating the Geology and Natural History of Massachusetts has been removed from Boston to the College, and is of much value for purposes of instruction.

The Knowlton Herbarium contains more than fifteen thousand species of named botanical specimens, besides a large number of duplicates. The Botanic Museum is supplied with many interesting and useful specimens of woods, seeds, and fruit models.

About one thousand species and varieties of plants are cultivated in the Durfee Plant-House, which yields a perennial supply of enjoyment and information to the students of both colleges.

The very extensive and, in many respects, unsurpassed collections in Geology, Mineralogy, Natural History, and Ethnology, belonging to Amherst College, are accessible to members of the Agricultural College.

Lectures upon Physics must also be given to agricultural students at Amherst College, until apparatus is provided for this indispensable department.

The Chemical, Engineering, and Military departments of the Agricultural College are well furnished.

Summary of Meteorological Observations for the year 1870, *taken at Amherst, Mass., by Professor* E. S. Snell, *LL. D.*

Latitude 42° 22′ 17″. Longitude 72° 34′ 30″. Elevation above the sea level, 267 feet.

REMARKS.

The weather in Amherst has been remarkable for the exceeding dryness of the last eight months of the year, and the consequent extreme heat of the summer.

The average amount of rain per month since May 1, was only 2.771 inches, the rain-fall for that month having been only 1.723 inches.

The mean annual rain-fall for the past ten years was 46.200 inches, while for 1870 the amount of rain and snow, measured as water, was only 39.700 inches.

The mean cloudiness of the ten years was .51 of the sky, while for 1870 the cloudiness was only .48.

The mean force of vapor for the ten years was .292 of an inch, and the humidity, 76; and for 1870 the former was .319, and the latter, 72.

The mean height of the barometer for the ten years was 29.712 inches; that for 1870 was 29.691 inches.

The mean temperature for the ten years was 46.87° Fahrenheit, while for 1870 it was 49.17°. The average temperature of each of the three summer months was above 70°, while in 1869 there was no month in the year with so high an average as 70°. The mean summer temperature of 1869 was 66.89°, while that of 1870 was 71.70°.

There was no frost for more than six months after April 1, and the mean temperature for the seven months after that date was 62.26°.

Indeed, we have no record of a season so warm as that of 1870, and it is a remarkable fact that the temperature did not fall to zero during the year. The winds have been unusual in respect to the amount and velocity from an easterly direction,—there having been two very severe and destructive gales from that quarter. In the month of June, one-half the wind was from the south-east. The winds of the ten years were distributed thus: From the north-west, 46 per cent.; from the south-west, 18; from the south-east, 24; and from the the north-east, 12. For 1870 the distribution was as follows: From the north-west, 43 per cent.; from the south-west, 15; from the south-east, 27; and from the north-east, 15.

During a portion of January, 1870, there was no frost in the ground, and the soil was in a fair condition for plowing, and this was successfully undertaken by several farmers in the vicinity of the college.

The spring flowers appeared about one week earlier than in 1869, as follows:—

Symplocarpus fœtidus, (skunk's cabbage), ...	Jan. 15.
Populus balsamifera, (poplar), ...	April 7.

A

Taraxacum Dens-leonis, (dandelion),	April 7.
Epigæa repens, (trailing arbutus),	" 9.
Ulmus Americana, (elm),	" 11.
Anemone nemorosa, (wind flower),	" 24.
Sanguinaria Canadensis, (blood-root),	" 24.
Fragaria Virginiana, (strawberry),	May 4.
Pyrus Malus, (apple),	" 8.
Sassafras officinale, (sassafras),	" 16.
Carya alba, (hickory),	June 1.

The hay crop was of excellent quality, but considerably lighter than it would have been, had more rain fallen in May and June. Early in July, pastures, except in low lands, began to fail, and the supply of fall feed was very limited. Oats and potatoes, especially the Early Rose and Bresee's Prolific, yielded a fair crop.

Corn, broom-corn, and tobacco, which withstand the effects of drought better than other crops, were nearly or quite as good as usual in the valley of the Connecticut; and corn fodder was never better.

The long continued dry, hot weather was very favorable to the sweet potato, which has been planted by many persons in the State the past season with very satisfactory results in most cases. Those grown in Amherst were large and of fine quality. Fruit of all kinds was ripened in great abundance, and was less affected by the drought, as to size, than might have been expected. Apples were very plenty, and grapes of all the hardy varieties were perfectly matured during the warm autumn.

SUMMARY OF METEOROLOGICAL OBSERVATIONS FOR 1870.

MONTHS.	THERMOMETER IN THE OPEN AIR.			RAIN AND SNOW.		CLOUDS.	WINDS. PER CENT. OF TIME AND FORCE.				BAROMETER. BAROMETER HEIGHT REDUCED TO FREEZING POINT.			FORCE OR PRESSURE OF VAPOR, IN INCHES.			RELATIVE HUMIDITY OR FRACTION OF SATURATION.		
	Maximum.	Minimum.	Mean.	Am't of rain or melted snow in gauge, inches.	Depth of snow, inches.	Mean amount of cloudiness.	Northwest.	Southwest.	Southeast.	Northeast.	Maximum.	Minimum.	Mean.	Max.	Min.	Mean.	Max.	Min.	Mean.
January, . .	54.3	5.0	30.78	5.872	13.0	6.0	40	20	21	19	30.380	28.820	29.786	.345	041	.160	100	40	75
February, . .	55.0	6.2	25.34	5.247	14.0	5.4	64	8	15	13	30.267	28.922	29 582	.419	.037	.107	100	45	73
March, . .	50.5	6.5	30.88	2.709	19.0	5.6	55	–	29	16	30.234	28.991	29 627	.267	.051	.124	100	33	71
April, . . .	78.0	35.0	48.26	3.701	0.5	5.6	26	13	25	36	30 153	29.368	29 688	.522	.094	.222	98	23	67
May, . . .	82.4	42.8	58.27	1.723	–	5.3	32	9	35	24	30.028	29.167	29.658	.610	.111	.324	98	18	68
June, . . .	93.0	53.5	70.45	2.728	–	5.6	25	15	50	10	29.888	29.316	29.676	.877	.275	.595	99	38	79
July, . . .	91 2	54.5	73 55	2 526	–	4.3	30	26	41	3	29.839	29.389	29.687	.872	.337	.597	97	34	74
August, . .	91.3	47.0	71.11	2 828	–	4.0	34	31	25	10	30.073	29.426	29 692	.835	.237	.527	96	33	70
September, . .	85.5	40.0	62.32	1.752	–	3.6	42	12	25	21	30.165	29.330	29.823	.689	.191	.390	97	29	71
October, . .	71.5	26.0	52 02	4.494	–	4.5	46	22	20	12	30 286	29.056	29.753	.587	.108	.289	98	33	71
November, . .	61 0	24.7	39.10	3.278	–	4.3	65	8	20	7	30.132	29.195	29.632	.435	.058	.171	100	18	68
December, . .	47.0	1.0	28.00	1.840	3.0	3.0	56	18	14	12	*	*	*	*	*	*	*	*	*
YEAR, . .	93.0	1.0	49.17	39.700	4.95	4.8	43	15	27	15	30.380	28.820	29.691	.877	.037	.319	100	18	72

* No observations in December.

REPORT ON THE PRODUCTION OF BEET SUGAR AS AN AGRICULTURAL ENTERPRISE IN MASSACHUSETTS.

By Prof. CHARLES A. GOESSMANN.

Among the various saccharine substances, which chemistry at present recognizes, are three of particular interest to the agriculturist, namely, milk sugar, grape sugar, and cane sugar. Milk sugar, which causes the sweetness of milk, is exclusively confined to this peculiar animal secretion, and constitutes in that of different animals from 3 to 9 per cent. Its application in an isolated form is quite limited, and its manufacture carried on mainly by the mountaineers of the Swiss Alps.

Grape sugar or glucose, which gives sweetness to the grape, is the most widely distributed of all saccharine substances. Most of our cultivated fruits derive from it, at least in part, their sweet taste.

It is the only one among the sugars previously enumerated, which we are able to produce by artificial means; its commercial importance, on account of its use for the production of alcohol and alcoholic liquors, as wine, beer, etc., and of sirups, is daily increasing. As our cheaper grains furnish the material, starch, from which grape sugar is mainly manufactured, its increasing production sensibly affects our home consumption of corn.

Cane sugar, which receives its name from its principal source, the sugar cane, is the kind which we commonly employ for household purposes, and is consumed in enormous quantities; while the number of plants which furnish it is quite limited. The sugar-cane, a few species of palm, the sugar-maple, the sorghum cane and the sugar-beet, are the plants which are turned to account for its manufacture. M. D. Dureau, in a report on the World's Exhibition of 1867, mentions that of the whole amount of sugar which has recently entered the various markets, 66.47 per cent is produced from the sugar-cane, 27.87 per cent from the sugar-beet, 4.29 per cent from the palms, and 1.24 per cent from the sugar-maple. The same authority states that the whole amount of sugar sold in 1867 in the principal markets was 5,140 million pounds, besides eighteen million gallons of sorghum molasses.* The consumption of sugar is steadily increasing among civilized nations; in France it has more than doubled within the last thirty years; in England it has doubled within the last fifteen years, whilst in Germany, its consumption has increased threefold within the same period of time. Numerical statements like those of Dureau, respecting the total production, are therefore not surprising; in fact, if we should allow to the whole population of Europe the same liberal supply of sugar, required by the citizens of the United States (30 pounds per head), the total amount stated would scarcely suffice to meet one-half the demand. More than nine hundred million pounds of various grades of sugar, besides from fifty to sixty million gallons of sirup and molasses from sugar-cane and sorghum have been annually consumed of late, representing a value of nearly one hundred million dollars, of which about seven-tenths are first cost, and three-tenths government taxation.

Home Resources.

The sugar produced in the United States is far less than the amount consumed, leaving a heavy balance for importation. The production of sugar-cane in Louisiana and Texas, it appears from reports of Champonnois and others, never exceeded four hundred and fifty thousand hogsheads, besides twenty thousand gallons of molasses; the maple-sugar production may have reached in favorable years from twenty to twenty-five million pounds; the sorghum plant has thus far yielded, with but a few exceptions, only molasses,† whilst the cultivation of the sugar-beet for the manufacture of sugar, has just begun to attract attention as worthy a more thorough trial in various parts of the country.‡ In presenting the above figures concerning our home production, I have chosen as far as the sugar-cane cultivation is concerned, the results of 1861, the most favorable year on record. Glancing over the early history of the sugar-cane in Louisiana, we find that the large production of sugar, conceded to her above, proves to be based on an exceptionally large crop, and gives by no means a correct idea of her past contribution to our home product. The sugar cane was first introduced into Louisiana in 1751; M. Dubreuil established the first plantation in 1758; from 1828 to 1843, its average produce per year has been about 82,000 hogsheads (90,000,000 pounds) of sugar, besides five to six million gallons of molasses; from 1844 to 1857, its annual produce averages two hundred and forty-one thousand and eight hundred hogsheads (each 1,100 lbs.), or 265 million pounds of sugar, with about sixteen million gallons of molasses; in 1854, there were one thousand four hundred and eighty-one plantations under cultivation, whilst in 1857, but one thousand two hundred and ninety-nine plantations are reported. The last report (1869) of the National Agricultural Department at Washington, D. C., states on the authority of M. Bouchereau, that one acre yielded during the past year 1,350 pounds of sugar, worth ten cents per pound, besides seventy gallons of molasses, worth sixty cents per gallon; and that improved lands fit for sugar-cane cultivation might be bought for from $25 to $40 per acre.

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* The home consumption, particularly in the East Indies, is apparently not estimated, for the home consumption of cane-sugar obtained from palms, is set down as 90,000 tons. (See Hunt's Commercial Review, Vol. 39, Nov., 1858, No. 5.)

† Mr. B. Moore, of Bloomington, Ill., and others, have produced a large quantity of crystallized sorghum-cane sugar.

‡ The first attempt to produce beet-sugar within the United States, is credited to David Lee Child, of Northampton, Mass., who made about 1,300 lbs. of sugar in 1838.

While the sugar-planters of Louisiana, a few years before the late war, thus apparently struggled to hold their slowly gained ground, we cannot help being struck by the prominent position which the sugar-cane cultivation acquired during the same period of time in the neighboring island of Cuba, which furnished for exportation from eleven to twelve hundred millions of pounds, about one-third of all the sugar that enters the markets of the United States and Europe. Unfavorable legislation with us is frequently cited as a cause of the results in Louisiana. Unsettled conditions regarding leading principles of political economy, no doubt, act most seriously on industrial enterprises, which require time for their healthy development; how much such influence may have interfered here, I do not propose to discuss, but shall confine myself to the exposition of a cause which has much to do with the past results of the Louisiana sugar-cane cultivation. A close examination of the statistics of the annual production of sugar in Louisiana, for over forty years past, leaves scarcely a doubt about the fact, that unfavorable climatic influences—as early frosts, and the consequent serious limitation of the harvesting season, must have interfered with the most profitable cultivation of the crop.

The fluctuations in the annual produce of sugar during successive years are so large and of so frequent occurrence, that any other assumption can scarcely account for it. Thus we have—

In 1834,	100,000	hogsheads.	In 1846,	140,000	hogsheads.
1835,	30,000	"	1851,	236,000	"
1838,	70,000	"	1853,	439,976	"
1839,	115,000	"	1856,	73,976	"
1843,	100,000	"	1860,	228,758	"
1844,	200,000	"	1861,	459,410	"

To rely on the production of one crop exclusively without abundance of ready capital is hazardous, even in exceptional cases, where the special character of the soil and of the climate, or the peculiar condition of the markets, seem to secure a monopoly, for these conditions are at the present time in the majority of cases but temporary. Wherever large gains are to be secured, competition will sooner or later enter the field. The cane-sugar industry of Louisiana, judging from past experience, cannot stand in unrestricted competition with that of the islands of the West Indies; but a judicious rotation of crops, and the introduction of other sound principles of modern farming, may produce better results in the future.*

Our production of maple-sugar is of little consequence as far as available quantity is concerned, and still less reliable in regard to its annual yield; since an early spring with warm nights may reduce it to a mere trifle. An increase of maple-sugar production is scarcely to be expected, and its chances are daily diminishing. Many of our barren, rocky hillsides might furnish suitable grounds for maple-groves, yet before broad-leafed trees will flourish, it is probably necessary that the exhausted elements of fertility be restored by the growth of one or more generations of pines.

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* The production of sugar from one acre of sugar-cane differs widely, and may be greatly increased, by the adoption of rational modes of cultivation. Upon Reunion 1,056 lbs. sugar are stated to be the annual results per acre, while upon Java, 4,045 lbs. are raised upon the same area. The great success upon Java is ascribed to the adherance to a judicious system of rotation, but one-fifth of the lands under cultivation being planted at one time with sugar-cane, the cane changing its place every two years, and the weeds upon the land being frequently burned, to destroy parasites, etc.

Our production of the sorghum plant, although spreading steadily in some portions of the country, has not yet received that attention in those localities, which, on account of a warm and long season, are particularly qualified to reap the full benefit of its cultivation. In a paper presented to the New York State Agricultural Society at their annual meeting in 1861, and printed in their annual report of that year, I stated the results of a chemical investigation carried out by me in 1857, concerning the fitness of the sorghum cane for the manufacture of sugar and of superior sirups. These statements have been confirmed, as far as its yield of a good quality of sirup is concerned; but the manufacture of sugar has not been tried to any extent, although there is no substantial reason why within some of the Southern States with their favorable climate, a part of its sugar might not be advantageously secured in crystals. A proper defecation of the sorghum juice before its concentration would doubtless accomplish that result. In making these statements here, I do not intend to assert that most of our Northern, and particularly our North-western States can profitably engage in the production of sorghum sugar. Localities liable to early frost and short seasons had better confine themselves, if at all engaged in sorghum cultivation, to the manufacture of sirups, for unripe cane is entirely unfit for the manufacture of crystallized sugar. The Middle and some of the Southern States have apparently not sufficiently appreciated the value of this crop. Associations between neighboring farmers for the purpose of supporting one cane-mill in common, no doubt, would reap handsome profits. Quick working of the ripe cane is essential to success, for there is no practical way as yet proposed, by which the sorghum cane may be preserved unchanged after it has attained its ripeness.

In view of these present conditions and future prospects of existing home resources of one of our most important articles for daily comfort, we must regard it as peculiarly proper that public attention is turning more and more seriously toward the question, whether with intelligent management the production of beet sugar as an industrial enterprise can be profitably undertaken in Massachusetts, as it has been in many countries of

Europe. Having witnessed personally the working of the sugar-cane upon the island of Cuba, and in Louisiana, and being also somewhat acquainted with the beet-sugar industry of Europe, and the treatment of sugar solutions for refining purposes, I do not hesitate to state, that the sugar-beet as a mere sugar producing plant is inferior to sugar-cane ; in fact, if it were possible to cultivate advantageously the best sugar-beet alongside of the sugar-cane, bestowing at the same time equal care on the cultivation of both plants, and on the treatment of their juices, they could be scarcely considered rivals. Yet, to-day, the beet-sugar manufacture is looked upon in Europe by agriculturists and by sugar manufacturers as a decided success.* England, even with her great facilities for importation, and her favorable commercial relations with cane-sugar producing countries, is hastening of late to add the beet-sugar manufacture to its home industry. English agriculturists have had for years occasion to notice the highly prosperous condition of the farms in beet-sugar producing districts of Germany, France, and elsewhere ; while English capitalists begin to believe in the sound foundation of the new business, when they notice the steady increase of beet-sugar importation into England, amounting in the year 1867 to a value of £1,600-000.

However different the views of the friends of the beet-sugar interest may have been at various times regarding its financial success as a mere industrial enterprise for a cheaper home manufacture of sugar, they all agree at the present day on one point, namely, that in connection with agriculture it has proved to be one of the most important, and at the same time, most successful attempts to stimulate the introduction of sound principles into agricultural pursuits, to develop, consequently, agriculture, and to promote a healthy feeling of a common interest between agriculture and manufactures, between capi-

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* The beet-sugar manufacture in Europe amounted in 1859 to 812,113,000 pounds ; in 1869 to 1,256,462,300 pounds, of which was produced—

By France,	32	per cent.
German Confederation,	28.5	per cent.
Austria,	11.8	per cent.
Russia,	14.83	per cent.
Belgium,	5.92	per cent.
Poland,	2.81	per cent.
Holland,	0.89	per cent.

tal and labor. Improved farm management and unusual progress in the modes of separating the sugar at a lower cost went hand in hand. European agriculturists have accomplished this thrifty union of mutual industrial and agricultural interests, only by devoting themselves with almost unrivaled perseverance to the task of producing a sugar-beet which contains the largest possible amount of sugar in the most favorable condition for extraction. The solution of the problem, whether beet-sugar manufacture can succeed with us, as a paying enterprise, will prove to depend here, as has been the case in Europe, on the interest which intelligent agriculturists and agricultural chemists will take in raising a suitable sugar-beet; for the quality of the root controls to a large degree the financial success of the industrial enterprise. A mere high percentage of sugar in the beet-root is not the sole requirement, although a most important one, but the production of a beet which contains the largest possible amount of sugar with the smallest possible percentage of foreign substances, whether saline, nitrogenous, or indifferent, non-nitrogenous organic compounds, for practice has established beyond doubt, that for every percentage of foreign admixture, about one and a half per cent of sugar in the juice will be rendered uncrystallizable, and thus converted into a less valuable molasses. It is of the utmost importance that the difficulties to be encountered be well understood, for a temporary check caused by want of proper precaution in producing a suitable beet, or providing the necessary apparatus, or oversight in the general management, would be deplorable, considering the benefits to be gained for agricultural development alone, in case the experiment should succeed. It is then to our intelligent farmers these few pages are addressed, for the purpose of aiding in the dissemination of facts, which have been instrumental in the development of the sugar-beet cultivation and the beet-sugar manufacture. Influenced by such views, I proposed a year ago to enter upon experiments concerning sugar-beet cultivation upon the college farm, and procured a variety of seeds from successful sugar-beet cultivators in Germany, believing that much was gained by having the best to begin with. The first year's crop has been gathered, and the percentage of sugar of each of the thirteen kinds ascertained. Beyond that point no experiments have been made; for as it was too late to control a proper manuring of the land used, I left the determination of foreign admixtures, which, in quality and quantity are decidedly influenced by the kind of manure applied, to another season, when the soil can be properly prepared and planted with carefully selected seeds. The results of the past season, being for the reason just referred to of a mere introductory character, will follow as an Appendix to these pages.

THE CULTIVATION OF SUGAR-BEETS.

The rules, by which beets are successfully raised for feeding purposes, do not apply to a successful production of the beet for sugar. In the first case, quantity is the main aim; in the second, besides quantity, a good quality is essential. A good sugar-beet is expected to contain not less than twelve per cent of sugar, a small percentage of saline substances, and the least possible amount of nitrogenous and non-nitrogenous constituents. The more nitrogenous compounds are present, the less sugar will be noticed; for they exert a controlling influence on the formation of sugar in the growing beet-root. The saline substances, on the other hand, do not affect injuriously the formation of sugar; yet, they place it under very disadvantageous conditions, as far as its final separation in a crystallized state is concerned; they favor the production of molasses and thus increase the manufacturing expenses. The history of the beet-sugar industry of later years is not without many illustrations of these damaging influences. Some late experiments in this country, no doubt, owe their failure, in part at least, to the fact, that virgin soil, rich in vegetable mould and saline constituents, has been used for the cultivation of the sugar-beet. Judging from analogy, we cannot but consider the reported gigantic roots and unusually large crops per acre as unfavorable features of some recent attempts in beet-sugar manufacture. The common mangel is no substitute for the sugar-beet in the production of sugar, while the latter is highly valued for feeding purposes and becoming daily more popular.

Among the various kinds of sugar-beets at present cultivated in Germany, the Silesian white sugar-beet (Achard's beet) is almost exclusively employed. Two of its sub-varieties, the pear-shaped white Silesian beet, with somewhat drooping leaves, (which is a cross-breed from the wedge-shaped Silesian white sugar beet and the Magdeburg chicory beet), and the Quedlinburg variety, with pinkish colored skin and red lines in the centre leaves, are particularly valued. The latter requires the richest soil. The French Vilmorin sugar-beets, on account of their superior saccharine property are also frequently raised ; yet as they are more liable to degenerate in the pits during the winter season, they are only cultivated to a limited extent, and are worked before frost during the latter part of September and October. The sugar-beet in its present state, a child of cultivation, is a variety of an unsightly biennial plant, *beta maritima*, which grows wild along the coast of the Mediterranean, in southwestern Europe. A comparison of the following analyses of the ash constituents of the wild and the cultivated plant gives some idea to what extent a systematic cultivation for particular objects, aided by climate and soil, may affect the normal mineral constituents of a plant. The wild beet-root may be called a soda plant, while the cultivated sugar-beet is decidedly a potassa-plant.

Wild Beet-root. (WAY.)

Potassa,	30.1	
Soda,	34.2	
Lime,	3.1	
Magnesia,	3.2	
Chlorine,	18.5	
Sulphuric acid,	3.8	
Phosphoric acid,	3.5	
Silicic acid,	3.6	
		100.00

Cultivated Sugar-beet. (BOUSSINGAULT.)

Potassa,	48.9	
Soda,	7.6	
Lime,	8.8	
Magnesia,	5.5	
Chlorine,	6.5	
Sulphuric acid,	2.0	
Phosphoric acid,	7.6	
Silicic acid,	13.1	
		100.00

It is well known, that, as a general rule, the various mineral constituents of a plant are indispensable to its growth, so that, if any one is wanting, the rest are thereby rendered incapable of supporting it. Our whole system of manuring, and even of rotation, rests upon this premise, and practical experience manifestly confirms it.

The composition of the ash constituents of the highly cultivated sugar-beet, compared with that of the wild beet, furnishes us with a striking instance as to what extent elements of a similar chemical character, for instance, potassa and soda, may be substituted for each other. We may also notice, however gradually such substitution may have been accomplished, that it inevitably affects the normal physiological processes going on in those plants which are subjected to such treatment. Whatever favors abnormal growth in plants surely aids in hastening on their premature unfitness for propagation, and their final extinction. A comparative study of our garden plants regarding their ash and other constituents, in their wild and cultivated state, would furnish us most likely with numerous instances of differences similar to those noticed in the case of the sugar-beet, and investigations of that kind could not but point out to us very important facts concerning the most advantageous selection of special manures for the production of a desired abnormal growth of our cultivated plants. Louis Vilmorin, the celebrated French gardener and seedsman, states that he raised, by proper selection, sugar-beets which contained in their juice not less than 21 per cent. of sugar, thus surpassing in sweetness the juice of the sugar-cane.

SELECTION OF VARIETIES OF BEET.

The successful cultivation of the sugar-beet begins with the selection of seed beets. Vilmorin's views on this subject are considered of great weight; a detailed exposition of his rules may be found in the Journal d'Agriculture Pratique, No. 5, 1858. He advises the selection of healthy, well-shaped beet-roots of from 1½ to 2 pounds weight, those, which with a large yield, show the most rings of leaf marks are preferred,—the specific gravity of their juice ought not to be less than 1.05; those which contain a juice of from 1.06 to 1.07 specific gravity are of superior character; seed-beets ought not to be taken from a soil which for the first time is turned into use for the production of sugar-beets, and the seed-beet fields ought to be kept separated from the general sugar-beet fields.*

SOIL FOR SUGAR-BEET CULTIVATION.

The best soil for the cultivation of sugar-beets is a mellow, deep, sandy loam with a free and permeable subsoil,—a soil named by German agriculturists a rich, first-class barley soil. A sandy loam, if deep and rich in well decomposed organic matter, is preferable to a clayish soil, for the latter becomes too compact and hard in a dry season, particularly after heavy rain showers, and thus frequently interferes with the growth of the fleshy roots ; and in wet seasons it produces a watery beet of inferior saccharine properties. In case the subsoil is not perfectly free, under-drainage becomes indispensable. A stony soil, or a thin surface soil, with gravelly subsoil, or a deep virgin soil with large quantities of half-decayed vegetable matter, are very objectionable ; and stagnant waters cause the premature decay of the roots at their lower termination.

Favorable physical properties of the soil are of the first importance, for fitness of the soil, as far as a necessary amount of plant food is concerned, may be secured by a carefully selected system of rotation, supported by a proper selection of special manures. Inferior kinds of soil, may, to a certain degree in some exceptional cases, answer for beet-sugar cultivation, yet they ought not to be solely relied upon as a safe basis for beet-sugar manufacture. A moderately warm and moist climate seems to be best adapted to this crop ; the northern sections of Germany and France being considered more successful than the southern parts of those countries. This observation may find its confirmation in the United States. Whether a change from Wisconsin to California merely on account of a warm climate would be a judicious move, future experience may teach,—but past experience does not point in that direction. The sugar-beets raised in southern portions of Europe have been found to contain more saline constituents than those raised in northern sections, a circumstance which must counteract their superior richness on sugar. A careful change to deep plowing is for obvious reasons highly recommended, provided the subsoil proves of a fit quality. In no case is the soil to be plowed to a less depth than eight inches; from ten to sixteen inches and deeper being desirable. Wherever deep plowing is undertaken for the first time, it is done during the fall, and the lands are immediately afterwards well manured. The rules for preparing the soil may be summed up as follows: Manure in the fall and plow the manure in deep; use only well rotted compost, if you are obliged to manure in the spring; begin the work in autumn at any rate, and turn the soil two or three times; do not work the soil when wet; pulverize it with the best implements, and as soon as possible; let not much time be lost between the last mechanical operation and the seeding.

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* The amount of beet seed raised per acre, varies from 12,500 to 25,000 pounds.

Stable manure is the basis of the whole system of manuring; commercial or artificial manures are only relied on as an aid. For this reason sugar-beets are usually raised as second crop, giving a chance for a thorough disintegration of the stable manure; the effect of the latter is supported in the second year previous to the planting of the sugar-beet, by a special commercial manure. The condition and the composition of the soil, quite naturally, control the whole system of manuring. As the soil in both respects will differ more or less, practical experience does not point out any one manure, which will answer under all circumstances; yet sufficient is known to assert what kind of manure has a good effect, and what has a bad effect on the sugar-beet, as far as the percentage of sugar and its final successful separation are concerned. The production of sugar being the main object, and on account of its high price affecting most decidedly the balance sheet, it is but natural that the agriculturist has now and then to compromise in the interest of the sugar manufacturer. Large crops of watery sugar-beets are not economical, where, as for instance in Germany, the beet-root is taxed; in France, where the sugar resulting from the sugar-beet is taxed, spring manuring is more freely resorted to.

Plants differ less in regard to the various kinds of food they need, than in regard to the quantities of each kind. Stable manure and plant ash are for this reason the only universal manures we recognize; the former is preferable to the latter, on account of its decided effect on the physical condition of the soil. The beet partakes largely of atmospheric food, and as the proper physical condition of the soil increases its disposition to absorb atmospheric plant food, we find that stable manure, and green crops turned under, are the best fertilizers; the only precaution recommended consisting in the advice to apply them in time to have them disintegrated before the beets are planted. The successful sugar-beet cultivator adheres to the rule to sell nothing without replacing it in some form or other, except what he has drawn from the atmosphere, the sugar,—considering almost everything else part of his real estate, which he cannot dispose of without injuring its value. Whatever he sells, besides sugar, is merely a matter of exchange; the mineral constituents, and to a certain extent the nitrogen, which the articles sold contain, whether in the form of milk, grain, or live stock, produced upon his farm, he brings carefully back, either by buying fertilizers, or better, by buying hay to manufacture the manure on his grounds.

We find no definite relation between the organic portion of plants and their mineral constituents; yet we know that an abundant supply of both nitrogenous and mineral substances controls the amount of oxygen, hydrogen, and carbon, absorbed for the formation of the organic constituents of plants, and that the available amount of these substances thus manifestly decides their final annual growth. It is thought best for this reason to calculate the amount of manure required for the production of a satisfactory crop from the quantity of nitrogen and mineral constituents, which a full crop contains. The form in which we apply the manures usually varies widely. They are rarely of a homogeneous nature, and require, therefore, more or less time for disintegration and final absorption; larger quantities of manure are consequently applied in starting a crop than it actually requires. It may be of interest to some to notice a few of those figures, which are commonly used as bases for the calculations of the time required to reap the full benefit of various kinds of manure.

	1 year.	2 years.	3 years.	4 years.
Stable manure, .	50 per cent.	25 per cent.	15 per cent.	10 per cent.
Flour of bone, .	30 "	30 "	25 "	15 "
Oil cake, . .	50 "	30 "	20 "	15 "
Peruvian guano, .	60 "	30 "	10 "	15 "

Pulverized commercial manures, as a general rule, are expected to work quickly, as slow action would seriously enhance their cost, adding interest of outlay to the capital; and most of them are designed to supply only special wants, and aid thereby in the production of large special crops. They therefore, if not proportionately supported by stable manure, green manuring, and a judicious rotation of crops, hasten on the exhaustion of the soil or general mineral plant-food. In some cases, as with guano, their effect depends, in an undesirable degree on the weather, whether dry or wet. Special manures occupy for these reasons a subordinate position. Potassa and phosphoric acid are, strictly speaking, the only plant constituents which have to be bought in consequence of the extensive stock-feeding usually connected with the farm management of sugar-beet cultivation for manufacturing purposes, particularly in cases where the molasses is sold, which contains a very large proportion of the soluble saline constituents of the beet-roots. Having attempted to enumerate some of the rules by which practice should be guided, it may be but proper to speak somewhat more in detail of the special effects of some of these manures. Fresh barnyard manure, particularly of horses and sheep, or liquid stable manure, or poudrette, and all manures containing uric acid are decidedly objectionable in the spring preceding the planting of the sugar-beet, for they induce an excessive growth of the leaves, shortening thereby the time for the ripening of the beet-roots, while favoring an increase of their nitrogenous constituents. They also cause a large absorption of saline constituents. In case barn manure has to be applied during the spring preceding the raising of the sugar-beet, cow manure is considered the least objectionable, but well-rotted compost is preferred. Guano and oil-cake, without any admixture of superphosphate of lime, act similarly to the most objectionable fresh stable manures. Saline compounds, as saltpetre, salt, Stassfurth manure-salt, &c., increase the quantity of beets, yet render them, if applied freely, rich in saline constituents. A mixture of one hundred and thirty pounds of Peruvian guano, and three hundred to four hundred pounds of superphosphate of lime per acre, or Chili saltpetre with superphosphate of lime, or wood ashes, or flour of bone, or well-rotted bones with wood ashes, are considered the best special manures for the production of superior sugar-beet. Green manuring, if applied in time, is highly recommended on account of its effects on the physical properties of the soil. Judicious selection of crops for rotation is most carefully resorted to in the interest of economy of manure and an undiminished productiveness of the soil. To render an efficient system of rotation possible, but one-fourth of the entire area under cultivation is planted annually with sugar-beets. In case a rotation of five or six years is possible the results are still more satisfactory. In the absence of a large farm, a number of smaller ones may thus successfully support a beet-sugar factory; and the soundest basis for a sugar-beet establishment consists in making arrangements by which the farmer is to have an interest in the produce of sugar. To engage merely in the cultivation of the sugar-beet for supplying existing factories is, however, considered a paying business, particularly if the farmer secures to himself in part at least the vegeetable refuse, as press-cake, &c., for stock feeding.

Planting of the Seed and Treatment of the Sugar-Beet.

The seed are planted by hand or by machine; theoretically from two to three pounds would be necessary for one acre, but in practice from fifteen to seventeen pounds are used. The seeds, after being soaked in water, if planted by hand, are placed usually at a distance of fourteen inches apart; if sowed by machine (of Garret's patent) they are dropped about eight inches apart in rows about twenty inches apart, which allows one horse with implement to pass between. In the latter case from 28,500 to 30,000 plants could be raised upon one acre. A larger space around each plant favors an excessive enlargement of the roots, a result not at all desirable, for large beets are usually watery.

A beet-root from one to one and one-half pounds is preferable to those from two to three pounds. Every common beet seed, containing by its natural construction from two to three germs, will produce as many plants, of which the strongest is left, whilst the rest are pulled up or otherwise destroyed in due time. The process of thinning out the plants takes place as soon as the roots have reached a length of from three to four inches, and, if possible, shortly after a rain, to prevent the loosening of the soil around the specimen left. A transplanting of sugar-beet plants from a separate bed to the lands for final cultivation is rarely resorted to; it is only recommended to fill out the gaps produced by the failure of seeds. Whenever this failure acquires any considerable proportion in the beet fields, a re-seeding is preferred, provided the season has not too far advanced. The soil around the young plant should be frequently loosened by proper implements (every two or three weeks), and the roots kept carefully covered, until the leaves have acquired their proper development early in June. Such treatment destroys the weeds and increases the hygroscopic and general absorptive properties of the soil, and thus favors highly an undisturbed, early and rapid development of the leaves. The latter, it is asserted, exert a controlling influence on the formation of sugar. M. Vilmorin considers a large number of rows of leaf marks, as previously stated, an essential property of a good sugar-beet. The leaves absorb as a general rule atmospheric food in proportion to their number and size. The sooner they acquire a good size, and the more numerous they are, the better are the chances of a copious formation of sugar, for this apparently depends to a great degree on the supply of atmospheric food. There are three distinct periods in the growth of the beet, viz.: the development of the leaves, which closes usually within the first half of June; the formation of the roots which is accomplished by the middle of September or first part of October; and, finally, the production of the seeds which takes place in the second year. The ripeness of the roots is indicated by a change in the color of leaves from a deep green to a yellowish tint. Those varieties which show a particular inclination to grow out of the soil are considered inferior. As soon as the leaves have reached their size, which happens in ordinary years usually in the fore part of June, the loosening of the soil and the covering up of the beet-roots ceases, leaving them undisturbed in their growth. To convey some idea concerning the peculiar features in the growth of the sugar-beet plant, I insert here some of the results of an interesting investigation in this direction by Dr. P. Bretschneider. The weights are in grammes, one gramme being equal to 15.43 grains:—

DATE.	Weight of the Root.	Weight of the Leaves.	Proportion between Root and Leaves.	Percentage of Sugar.
June 12, . . .	0.2005	–	–	2.13
21, . . .	5.3000	–	–	4.17
July 9, . . .	78.3000	286.	1 to 3.65	4.99
16, . . .	109.600	226.	1 to 2 06	8.86
29, . . .	166.	224.	1 to 1.34	–
Aug. 8, . . .	124.	106.	1 to 0.56	11.27
26, . . .	228.	121.	1 to 0.53	11.52
Sept. 19, . . .	586.	316.	1 to 0.59	11.45
19, . . .	169.	38.	1 to 0.22	10.80
19, . . .	204.	50.	1 to 0.25	13.15

The harvesting of the sugar-beet root begins, when the outer leaves turn yellow and dry, which in different seasons and localities may vary from the fore part of September to the first of October; the past season being with us unusually dry and warm caused a somewhat premature dying out of the leaves upon our experimental field. The gathering of the leaves, even in part, at any preceding stage of the growth of the plants, is seriously objected to, for it affects most decidedly the final yield of sugar. Nature, in its wonderful economy of matter and force, always provides for the continuance of species under the most advantageous conditions, storing up in some of the organs of plants under the influence of a favorable summer temperature a maximum of such compounds as will enable them to develop their organs for propagation almost independent of outside assistance. The flowers and subsequently the seeds draw upon the food accumulated in roots, stalks and leaves, and the seeds themselves again store up an amount to enable the embryonic germ to provide itself with such organs as will fit it to fulfill its mission in the production of a new plant. Sugar is undeniably one of those substances which are required to support the beet-root plant in this last stage of growth.

The amount of sugar in the sugar-beet is largest when the root has just attained its ripeness; subsequently, it diminishes gradually in consequence of advancing growth. To preserve undiminished the maximum percentage of sugar till the time of manufacture is somewhat difficult. There is no such thing in nature as absolute rest. If it were practicable to keep the beet-root frozen from the beginning to the close of the manufacturing season, it might prove to be the most efficient mode, so far as the preservation of sugar is concerned. The manufacture of the sugar begins usually in the latter part of September, and the beet-roots are daily carried in such quantities from the fields as the factory can dispose of. Those varieties, like the Vilmorin beets, which do not keep well in the pits over winter, are first gathered and worked up. As soon as frost becomes imminent, all the roots are gathered after the removal of the leaves, which operation is carried on upon the fields. They are then buried in suitable pits without loss of time. The beets are raised out of the soil by means of forks, and the leaves cut off with sword-like knives about one-half to one inch from the root. To cut off the top of the beet-roots from those which are to be kept over winter is disapproved of. The use of the plow in harvesting is also objectionable on account of frequent laceration of the roots.

The mature roots after being freed from the leaves in the manner just described, are with the adhering soil laid carefully into shallow pits about six feet long by three feet wide, and from four to five feet in depth. These are, finally, covered with soil to protect them against frost. Small pits of the size just described are preferred, for they allow a better control of the temperature than large pits, which frequently suffer from an undesirable increase of heat, causing the growth of leaves or degeneration by decay. The covering of soil is gradually increased in thickness with the advancing season, amounting usually to a final thickness of three feet, and this is sometimes rendered more efficient by a thin outer layer of stable manure. To secure a uniform moderate temperature is the sole object of these proceedings, and pits beginning to heat, are worked up without delay. The pits must be located upon very dry land on or near the beet fields, and in such a position that no accumulation of water can injuriously affect them.

To give some idea about the changes which a good sugar-beet undergoes in the pits even under quite favorable circumstances, I insert the following statement of H. Rake. The same kind of beet-roots contained—

In October, 1862:

Cellulose,	3.49
Water,	82.06
Cane sugar,	12.40
Grape sugar,	–
Mineral constituents,	0.75
Albuminous and extractive substances,	1.30
	100.00

In February, 1863:

Cellulose,	2.52
Water,	84.36
Cane sugar,	10.60
Grape sugar,	0.65
Mineral constituents,	0.63
Albuminous and extractive substances,	1.20
	100.00

Whenever the roots begin to rot the sugar is lessened; the loss due to the sprouting of the leaves may amount to two per cent more than the preceding analysis states.

YIELD OF SUGAR-BEETS.

The numerous varieties of beets differ widely in regard to their annual yield, independent of the conditions of season, upon the same soil and under the same treatment. Whilst common mangels have been raised upon a suitable soil, in exceptional cases, at the rate of from ninety-four to one hundred and ten tons per acre, the sugar-beet never yields at anything like such a rate. The following statement respecting the yield and amount of sugar obtained from three kinds of beets is quite interesting and suggestive regarding the important question, what kind of beet roots are the most desirable for cultivation for the manufacture of sugar.

NAMES.	Annual yield of Roots per acre.	Percentage of Sugar.	Amount of Sugar in the entire Root Crop.
Metz (fodder beet), . .	86,457 pounds.	4.5 per cent.	3,890 pounds.
Imperial (sugar-beet), .	59,613 "	10.51 "	6,265 "
Silesian White (sugar-beet),	52,787 "	13.64 "	7,200 "

These few numerical statements teach most decidedly, that mere quantity will not insure success for the beet-sugar interest. We find in practice as a general rule that the mean annual yield of sugar-beets is less than in the cases cited. In Silesia, the crop averages from 18,000 to 19,000 pounds per acre, and the beet juice itself is expected to contain throughout the entire sugar-making season from 11 to 13 per cent of sugar, which indicates that scarcely any roots with less than 12.5 per cent of sugar are worked in that district. In Saxony, from 23,500 to 24,000 pounds are obtained per acre, and, in exceptional cases, even as high as from 30,000 to 31,000 pounds are reported. In France, where the sugar resulting, and not the roots used for its manufacture, are taxed, the annual yield is larger than in Germany, one acre yielding there from 38,000 to 40,000 pounds of roots. Yet a larger final yield of sugar is claimed from one acre in Germany than in France.* The cost of production in Germany is set down at from 21 to 22 cents per hundred pounds of sugar-beet roots.

Those who sell their sugar-beets at the factory, receive from

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* In Germany 100 pounds of sugar-beet roots are taxed (8 sgr.) 19.44 cents (1869). In France every (52 kilogrammes) 114.4 pounds of beet sugar are taxed (13 francs and 75 centimes) 2.66 dollars. Every 1,000 kilogrammes or 2,200 pounds of sugar-beet roots yield on an average (52 kilogrammes) 114.4 pounds of sugar in the form in which it is taxed. (Walkhoff.)

25 to 27 cents per hundred pounds, together with one-half of the vegetable refuse or press-cake.

Not unfrequently, separate contracts are made for furnishing small beets not exceeding two pounds in weight. The sugar-beet cultivation usually becomes a prominent feature of agricultural industry in the vicinity of beet-sugar factories, for although the manufacturer of sugar is, as a general rule, to some extent at least a producer of beets, he rarely limits himself to the amount of his own produce. He finds it profitable to purchase a certain quantity, if for no other reason, in order to be enabled to cultivate his own lands on a liberal system of rotation. He, also, frequently retains one-half of the press-cake and other refuse resulting from the working of an additional amount of beet-roots, for stock feeding and manuring purposes.

YIELD OF JUICE.

The sugar-beet contains about 82 per cent of water, and 80 per cent of its juice may be obtained by subjecting the crushed beet to a powerful pressure. The relation of the power applied to the quantity of juice obtained may be inferred from the following statement of Walkhoff:—

By	50	pounds of	pressure to	the	square	inch,	60	per cent.
	80	“	“	“	“	“	64	“
	400	“	“	“	“	“	75	“
	750	“	“	“	“	“	80	“

The press-plates are made 14 inches or more square, and 24 pounds of pulp for every 100 square inches of press surface is considered the best proportion. The roots are usually changed into a pulp by circular saws fastened upon two hollow iron rollers running in opposite directions. Water is added (from 15 to 30 per cent) while preparing the pulp to reduce the amount of sugar left in the press-cakes. By means of this and numerous other devices from 80 to 87 per cent of the actual juice in the beet-roots is secured. The profitable addition of water is limited by the expense arising from the evaporation of a diluted juice.*

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* One hundred pounds of coal are required for the evaporation of 500 pounds of water, in the course of beet-sugar manufacture.

The extra expense necessary to procure more than 80 per cent of the juice diminishes largely its value, nevertheless improved methods are constantly sought and are doubtless attainable.

The press method and Roberts'* modification of warm and cold maceration of the fresh beets have apparently the warmest advocates. It would be a vain attempt on my part to treat here in a becoming manner on these questions. I propose to leave that task to some future occasion, when the manufacture of beet-sugar will be discussed. The supply of labor, fuel, and water, the condition of the sugar market, &c., control, as every manufacturer is aware, in such a degree the choice of apparatus and modes of operation, that very little information could be gleaned from a general discussion without some detailed explanation. To the farmer, the vegetable refuse, as press-cake and like substances, is of prime importance, and the various modes of abstracting the juice from the beet roots affect him only in so far as the value of the refuse for feeding purposes is concerned. A comparison of the composition of the juices obtained by means of a powerful hydraulic press and by Roberts' maceration, (or the dialytic mode), can aid in understanding this question of which I shall have to treat somewhat more in detail hereafter:—

I.

Beet juice procured by the aid of a hydraulic press contains:—

Sugar, ...	12.410	per cent.
Potassa and soda compounds, .	0.458	"
Lime and magnesia, . . .	0.187	"
Nitrogenous substance, . . .	1.418	"
Non-nitrogenous organic substances, ...	1.048	"

II.

Beet juice procured by Roberts' diffusion apparatus with an addition of 15 per cent of water, contains:—

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* Roberts claims to secure 94 per cent of the juice by adding but 15 per cent of water, and carrying on the first osmotic maceration at 87 to 80 degrees centigrade, and the remainder at a common temperature.

Sugar, ...	11.580	per cent.
Potassa and soda compounds, .	0.441	"
Lime and magnesia, . . .	1.191	"
Nitrogenous substance, . . .	0.791	"
Non-nitrogenous organic substances, ...	0.983	"

YIELD OF SUGAR.

According to the mode of operation pursued, more or less sugar will be left with the cellular refuse mass. The residue of the hydraulic press contains from 3.6 to 4.8 per cent of sugar, or 0.76 per cent of the amount in the original sugar-beet; while Roberts' mode leaves but 0.1 to 0.2 per cent of sugar. Between these figures lie the quantities of sugar left by the application of other modes of operation. With the removal of the juice begins consequently the loss of sugar, which amounts during the whole operation for its final separation to about 3.5 per cent under a good management of existing methods. To set down losses which occur in a branch of manufacture where peculiar skill so decidedly bears upon the final results, is no doubt quite arbitrary; but it is of interest to notice where they usually occur, and to what degree they affect the final results in many instances. The following statement is presented as a fair one and may serve the purpose just specified:—

One hundred parts of sugar-beet roots, under fair management, are liable to lose sugar as follows:

In the pits by degeneration, . .	2.00	per cent.
By change into grape sugar, . .	0.54	"
In process of filtration of the juice, .	0.14	"
In defecation and carbonization, .	0.21	"
In juice left in the press-cake, . .	0.76	"
Total loss, ...	3.65	"

One hundred parts of sugar existing in the beet roots were, in one case, accounted for in the following way at the close of manufacture:—

Crystallized sugar, ...	62.46 per cent.
Sugar left in the molasses, . .	14.75 "
Lost during manufacture, . .	22.79 "
Left in the press-cakes, . . .	11.48 "

Eight per cent of sugar from the beet is at present assumed to be the actual result of most factories with improved modes of operation and superior sets of apparatus; some factories claim even more. The importance of an increase in the yield of crystallized sugar may perhaps be best inferred from a case reported by W. Crookes, F. R. S., in his late publication on beet-sugar manufacture with reference to England. Mr. Baruchson, the beet-sugar manufacturer, is reported as stating that the factory cost £10,845; 150,000 pounds of sugar-beet root has been worked per day for five months; the expenses for labor amounted per year to £5,190; the total expenses per year had been £13,980; the total receipts per year were £20,470; the profits thus had amounted to £6,490, or 24.75 per cent on the first outlay; 6.5 per cent of crystallized sugar had been the result. He further states that one-half per cent of increase of the yield of crystallized sugar would be equal to 7.5 per cent additional profits; eight per cent of crystallized sugar from every 100 pounds of beet roots worked, would thus insure a profit of 48 per cent. Accepting this statement as correct, there is no doubt, but that the English beet-sugar manufacture ought to prosper under their present revenue law. In Germany, where eight per cent of crystallized sugar is obtained, the yield per acre varies from 1,520 to 2,270 pounds of sugar. In France, where but six per cent of sugar is obtained (Walkhoff), the yield is said to be from 1,706 to 2,650 pounds per acre. The same authority states that the average expenses in Germany for the production of sugar per acre, taking the average yield of beet roots as from 23,000 to 24,000 pounds, amount to from $132 to $133, of which the government takes in form of taxes from $45 to $46; while in France, assuming the average yield of beet roots per acre to be from 36,000 to 37,000 pounds, and separating 114.4 pounds of sugar from every 2,200 pounds of beet roots, the whole average expenses per acre for beet-sugar amounts to from $161 to $162, of which the government draws for taxes on sugar $50.75. The expenses in the two countries are divided among the different operations in the following proportion:—

In Germany:*

Manure,	14.48 per cent.
Cultivation of beets,	11.20 "
Taxes on sugar,	34.82 "
Manufacturing expenses,	39.40 "

In France:

Manure and cultivation of beets,	24.40 per cent.
Taxes on sugar,	31.59 "
Manufacturing expenses,	44.01 "

Taking the produce of an American acre as equal to from 23,000 to 23,500 pounds, and presuming an average percentage of sugar in the beets of from 11 to 12 per cent, allowing at the same time 80 per cent of juice, which contains but 9.6 per cent of the sugar in the beets, and calculating, finally, but 6.5 per cent of crystallized sugar as obtainable from 100 pounds of beets, an American acre would yield 1,500 pounds, which at seven cents per pound† would amount to $105. The molasses obtained from the sugar-beet is not fit for household consumption on account of its unpleasant saline taste. It is fermented in most cases for the production of alcohol, and rarely fed to live stock, as its continued use, even in small quantities, is not considered safe, from its effect on the digestive organs. Its value as food is about one-half that of good hay, and its effect is similar to that of oil-cake. 1.8 pounds of molasses per day mixed with clover hay or even straw has increased the yield of milk. Sometimes the molasses is mixed with caustic lime or the carbonate, and composted for manure.

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* Recent reliable private communications coming from different sections of Germany state the expenses for the production of sugar-beet roots, when in the pits, in one case at $46 and in another at $59.50 per acre. Land rent in both cases was equal and amounted to $12.50 per acre; manure in the first case amounted to nearly one-half, in the second case to but one-third of all expenses. The price of labor caused the difference.

† To assume a higher value is unsafe, considering the unsettled views concerning the degree of protection which our sugar industry may claim.

AVERAGE COMPOSITION OF BEET-SUGAR MOLASSES.

Albuminous substances, . . .	9.2	per cent.
Sugar, ...	41.3	"
Other organic substances, . . .	16.1	"
Saline compounds, ...	10.8	"
Water, ...	22.6	"
	100.0	"

The saline constituents of course differ somewhat in every case, particularly as far as the lime compounds are concerned. The following analytical results, (Trommer & Rode), may give some idea about their general character.

One hundred pounds of ash constituents of beet-sugar molasses contain of:—

Potassa, ...	30.46	per cent.
Soda, ...	10.12	"
Lime, ...	26.62	"
Sesqui-oxide of iron, . . .	00.04	"
Carbonic acid, ...	19.07	"
Sulphuric acid, ...	1.92	"
Silicic acid, ...	0.06	"
Chlorine, ...	10.03	"
	100.00	"

The residual liquid left after the fermentation of the molasses is usually evaporated and the solid mass subsequently calcined. The beet-sugar manufacture furnishes in this form quite a large quantity of valuable saline compounds for general industrial purposes. One hundred pounds of these calcined saline substances contain from 45 to 48 per cent of soluble constituents of a composition more or less corresponding with the following figures:—

Carbonate of potassa, . . .	27.60	per cent.
Carbonate of soda, ...	4.70	"
Chloride of potassium, . . .	6.75	"
Sulphate of potassa, . . .	6.75	"
	45.80	"

One single beet-sugar factory at Wagehäusel (Germany), sends every year 200,000 pounds of such potassa salts into market, which is mainly used for the manufacture of nitre. The molasses contains by far the largest portion of the soluble saline constituents of the sugar-beets, particularly the potassa compounds which must be returned to the soil directly or indirectly. The cheaper crude sulphate of potassa of Stassfurth is bought at present in exchange for the carbonate of potassa sold.* Distilleries are frequently connected with sugar beet manufactories.

The Cellular Residue of the Beet Root.

The juice is obtained in different ways, and, according to the mode adopted, the quality of the residue is affected. The press-cakes resulting from the application of the hydraulic press, which is the main apparatus employed, are compact in consequence of packing the pulp into bags or coarse linen cloths before subjecting it to the press. 100 pounds of beet roots furnish from 18 to 20 pounds of press-cakes, which consist, in case a very powerful press is used, of :—

Albumen, ...	1.336	per cent.
Potassa, ...	6.487	"
Sugar, ...	4.945	"
Cellulose, ...	11.922	"
Saline matters, ...	1.180	"
Water, ...	74.130	"
	100.000	"

These cakes are highly valued for feeding purposes; 100 pounds of press cakes are valued at 29.6 cents, when hay is worth 20 dollars per ton; the cellular residue of beets left after the abstraction of the juice by other modes is as a general rule less valuable. For instance, the residue after the treatment with centrifugal apparatus and the subsequent displacement process is considered worth but 16.9 cents per 100 pounds; that obtained by hot maceration of dried beet roots is held at from 24 to 25 cents per 100 pounds, while that obtained by a maceration of the fresh beet roots after Roberts' improved method, (free from an excess of lime), is valued at from 7.2 to 9.1 cents per 100 pounds. The last named residue contains but from 5.5 to 6.9 per cent of dry substance, while common press-cakes contain 25 per cent. Roberts' mode of operation leaves about 70 pounds of cellular residuum for every 100 pounds of beet, which contains, as stated previously, more nitrogenous matter in proportion to dry substance, but less sugar than common press-cakes. It is worth as fodder about one-quarter as much, according to the estimate of Grouven.

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* The producer of potatoes sells in an average crop of 7.41 acres (three hectares) the mineral constituents of four crops of wheat besides 600 pounds of potassa, and in an average crop of beet roots from the same area the mineral constituents of four wheat crops, besides 1,000 pounds of potassa.—*Leibig.*

One and one-half tons of press cakes are assumed in practice as the produce from one Prussian morgen,* or 4,700 pounds per acre, so that allowing a value of 29 cents for every 100 pounds, the whole amount of press-cakes from one acre would be worth $13.60. Moreover, as 100 pounds of common press-cakes contain 25 per cent of dry substance, 4,700 pounds contain 1,175 pounds; and as the dry substance of any article of vegetable food is known to furnish 1.75 times its weight in common stable manure, 2,056 pounds of manure will result from the feeding of the press-cakes of one acre. Reckoning one ton of manure worth $1.75, 2,056 pounds will be worth about $1.80. The fodder value of press-cakes resulting from the operation with the hydraulic press without subsequent maceration is equal to the same weight of sugar-beet roots. They are even preferred to the latter, since they become more digestible and acquire, after being buried in pits in consequence of slow fermentation, a slightly acidulated taste. Cattle then eat them greedily and thrive upon them, particularly in case they are fed in connection with a proper quantity of oil-cake, bran, hay, or barley straw, &c., to replace the potassa compounds and the phosphates which the juice has carried off.

The preservation of the press-cakes is easily accomplished. They are packed closely into the empty beet-root pits or into brick chambers, being frequently interlaid with a small quantity of chopped straw, and, finally, tightly covered with soil. The fermented mass resulting from this operation keeps in an excellent state of preservation for six to seven months.

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* In this report all calculations concerning reductions of German surface measures and of money value are based on the following proportions: one American acre is considered equal to 1.58 Prussian morgen, and one Prussian thaler equal to 0.73 dollars.

PRODUCE OF LEAVES.

The leaves amount at the time of the harvesting of the roots to about one-fourth of the weight of the latter; calculating as previously, 6,000 pounds of leaves would result from an acre. The leaves are separated upon the fields and subsequently in their green state plowed under deeply, or they are fed either fresh or in a preserved state. The manuring effect of the beet leaves is very great, since they contain in their fresh state more potassa, more phosphoric acid and more nitrogenous substances than an equal weight of roots. Their ash percentage is also larger than that of the beet roots, consisting mainly of alkalies and alkaline earths. Almost one-third of all the potassa, one-half of the phosphoric acid, and two-fifths of the whole amount of nitrogenous substances of the entire sugar-beet crop is contained in the leaves. As they can be fed in small quantity only, in their fresh state, they are salted down in pits. The pits used for this purpose ought to be in a dry locality and dug to a depth of from five to six feet. The bottom is covered from two to three inches thick with a layer of chopped straw of oats, rye or wheat; then a layer from four to five inches thick of fresh beet leaves, mixed with one-quarter of one per cent of common salt is put on and trodden down, and these alternations continued until the pit is not only filled, but raised from two to three feet above the ground, and then a layer of two feet of soil is added as covering. In the same proportion as the mass shrinks in consequence of fermentation new soil is added to keep the covering above the level of the surrounding ground as protection from the rain. The leaves in the pits begin soon to ferment and to discharge moisture, which the straw absorbs; they retain a strong smell until January, when they turn by degrees sweet and are on that account freely eaten by cattle. Sixty pounds of fresh green leaves produce forty pounds of preserved leaf-mass; one acre furnishing thus about 3,900 pounds of such food, which, taking 100 pounds of hay worth one dollar, is valued at 16.3

cents per 100 pounds. One acre would thus produce in food derived from the leaves $6.35; fresh leaves have 11.99 per cent of dry substance, preserved leaves contain 15.0 per cent; the leaves of one acre of sugar-beet root contain therefore 585 pounds of dry substance; which multiplied by 1.75 gives about 1,000 pounds of manure from this source of food. The leaves are never fed by themselves. Grouven recommends the following composition of food for every 1,000 pounds of live weight per day: 40 to 50 pounds of preserved leaf-mass, 40 pounds press-cakes, 3 pounds of rape-cake with 6 pounds of hay. In proposing this composition of food, he presumes that 25 pounds of perfectly dry hay represent the normal quantity of food required to support 1,000 pounds of live weight per day. A comparison of the mineral constituents contained in 25 pounds of dry hay and 25 pounds of dried sugar-beet leaves explains the proposed practice.

Hay.

Potassa,	0.80	per cent.
Phosphoric acid,	0.20	"
Sulphuric acid,	0.07	"
Chloride of sodium,	0.12	"

Dry Preserved Leaves.

Potassa,	1.00	per cent.
Phosphoric acid,	0.14	"
Sulphuric acid,	0.28	"
Chloride of sodium,	0.52	"

The small quantity of phosphoric acid and the large percentage of sulphuric acid and chloride of sodium in the beet leaves renders their exclusive use objectionable. They are, therefore, fed in common with substances like oat-meal, oil-cake, bran, clover, hay, &c., on account of their richness in phosphates, &c. Preserved beet leaves, it appears from experiments of Tod, increase the production of milk in quality and quantity, whilst press-cakes, if exclusively used, reduce its quantity decidedly. A mixed food of 100 pounds of press-cakes with 75 pounds of preserved leaves produced for every 100 pounds of leaves fed, an increase of 24.5 pounds of milk per day, as compared with a corresponding feeding of press-cakes alone. The value of press-cakes and preserved leaves for the support of live stock, particularly during a period when food as a general rule becomes scarce and thus expensive, must be quite apparent; especially when we consider further that every ton of sugar-beets raised furnishes 400 pounds of press-cakes and 400 pounds of fresh leaves, and that an ordinary factory consumes from 40 to 50 tons of beet roots per day during five months. In cases where stock feeding is no part of the enterprise, or where plenty of other kinds of food is at hand, the leaves while still green are plowed under. The part which the beet leaves perform in the absorption of mineral constituents from the soil may be seen from the following analytical statement:—

A fair average crop of sugar beets abstracts per acre,—

By Roots and Leaves.

Phosphoric acid, ...	35	pounds.
Potassa, ...	164	"
Lime and magnesia, . . .	63.50	"
Silica, ...	15.09	"

By Roots Alone.

Phosphoric acid, ...	25	pounds.
Potassa, ...	126	"
Lime and magnesia, . . .	32	"
Silica, ...	6.5	"

Returned in form of Leaves.

Phosphoric acid, ...	10	pounds.
Potassa, ...	38	"
Lime and magnesia, . . .	31.5	"
Silica, ...	9.4	"

The General Influence of the Sugar-Beet Cultivation on the Condition of the Soil.

The first question which will be forced upon us in this connection, is: Can the sugar-beet be raised upon the same lands continuously without reducing their value either for the production of sugar beets or for general farm management?

It is no doubt most convenient to refer for an answer to Germany and France, and notice the conditions of the lands engaged in the beet sugar cultivation for generations. We shall find that the yield of good sugar-beets is not diminishing, that the beet sugar industry in fact is continually growing—(has increased in Germany within the last fifteen years threefold)—and instead of reducing the general farm products, in consequence of engaging so large an area in the sugar-beet cultivation, we know from statistical reports that they exceed in value the farm products of previous periods. High farming based on rational principles has taken the lead; to increase the fertility of the soil has been the aim; advantageous systems of rotation have been introduced and the effects of special manures have been subjected to close study. Science has made itself familiar with common farm routine, and an enterprising farming community has listened to its advice. Two facts are quite evident to every intelligent farmer: first, that a certain chemical and physical condition of the soil is required to secure by the crops raised a satisfactory compensation for labor and expenses incurred in its cultivation; and, secondly, that the plants we cultivate differ in their requirements in both directions. The mineral constituents needed for the support of any one kind of plant will be sooner or later exhausted, for nature as a general rule does not change the mineral compounds required for the maintenance of a forced vegetation into a fit state for assimilation so rapidly as most of our farm crops, and the sugar-beet in particular, require. Fortunately for us the disintegrating surface of our globe has been for ages subjected to a leaching process, and its products are daily more and more opened to us in the form of saline deposits of every description; the accumulated results of animal and vegetable life of past generations are brought back to us in the form of guano and phosphates of varying character, while chemistry has taught us how to assist nature in its preparation of plant-food. The physical conditions of the soil, however favorable they may have been, will suffer, if year after year subjected to the same or a similar treatment for the cultivation of one and the same plant; diversity in its mechanical treatment and change of seasons for such treatment cannot otherwise but affect favorably its mechanical condition and its chemical disintegration, promoting thereby its fitness for the absorption of atmospheric food. The roots of the same plants abstract their food year after year from the same layer of soil; while a change of crop frequently alters the depth from which the food is absorbed. To cultivate the same plant upon the same spot for any length of time is also objectionable on account of the particular chances offered for the growth of those parasites and insects which make that plant their home. These and other reasons demand imperatively a rotation of crops.

The sugar-beet sends its rootlets to a depth of several feet, and draws consequently largely from the subsoil; the latter is on that account, as stated before, of great importance. As the sugar-beet also depends in a high degree on atmospheric food, its leaf growth must be stimulated by a most careful pulverization of the soil, and as the fleshy root needs for its growth a loose, deep soil, deep plowing has been generally introduced. Thorough cultivation and a perfected system of under-drainage being absolutely indispensable to the highest success must necessarily improve the condition of lands devoted to beet culture. Green manuring and a liberal use of stable manure have also been employed to render the soil mellow and rich, and thus the farm lands have reached by degrees a high state of fertility. The use of special commercial fertilizers is resorted to not to the exclusion, but in aid of stable manure, and thus the chemical and physical requirements of the soil are met in the most efficient way. Rotation of crops in connection with a rotation of special manures has demonstrated the practicability of preserving unimpaired the fertility of soil engaged in sugar-beet cultivation.

Without entering here in detail upon this much studied question, I propose to state merely a few observations of a more general interest, in addition to what is said in previous pages. Well manured annual leaf crops for green feeding, are considered the best crop to precede the beet; next in order, follow well manured summer or winter grain crops; less recommended are perennial grasses and other fodder crops; directly objectionable are, if not specially manured, potatoes and root crops in general, of which the mangel is the worst. The sugar-beet, on the other hand, is a good crop to precede almost any other farm plant. The succession of crops adopted in the interest of sugar-beet industry has reference to two important objects, namely, an adequate supply of food to each crop and the production of the largest possible amount of animal manure. A fair crop of beet roots is of course more exhausting to the soil, as far as phosphoric acid, and particularly potassa, is concerned, than most of our farm plants; a judicious system of rotation divides that effect over several years, and thus enables the farmer to draw more efficiently on the natural resources of the soil, and so avoid a direct outlay of money. The following succession of crops is considered very satisfactory, viz.: green fodder, wheat, sugar-beets, and, finally, a summer grain crop; or barley, sugar-beets, barley, green fodder, wheat, sugar-beets; and these are economical as far as manure is concerned. Two thousand three hundred pounds of hay, or its full equivalent in fodder value, are considered sufficient to replace the constituents which a fair beet sugar crop abstracts per acre in excess of what the refuse material resulting from such crop in the course of beet sugar manufacture will compensate for. The amount of refuse material fit for manuring purposes is counted per acre equal to 4,700 pounds. T. T. Fühling's figures on this question are of great interest as they come from a practical sugar-beet cultivator, whose opinion is regarded as of great importance. They refer to pounds per acre.

	I.[*]	II.[†]	III.[‡]	IV.[§]	V.[‖]
Nitrogen, ...	36.4	19.8	16.6	23.7	32.
Potassa, ...	96.4	19.	77.4	28.5	33.2
Soda, ...	39.5	6.3	33.2	9.5	3.2
Lime, ...	14.2	28.5	33.2	4.	28.5
Magnesia, ...	9.5	11.9	33.2	4.3	9.5
Chlorine, ...	28.5	2.4	26.1	4.3	9.5
Sulphuric acid, . . .	7 9	6.4	1.5	11.5	9.5
Phosphoric acid, . .	15.8	9.5	6.3	2.	4.8
Silicic acid, . . .	17.4	–	6.3	8.	47.4

[*] Substances abstracted by a full sugar-beet crop.

[†] Substances returned in the manure obtained from sugar-beets.

[‡] Amount of substances not replaced by that manure.

[§] Amount of substances abstracted per acre during a four years' rotation as detailed.

[‖] Amount of substances restored to the soil by the manure resulting from the feeding of 2,300 pounds of hay.

Comparing these analytical results, we find that the manure obtained from the beet roots and from the hay replace what, in the course of a few years' rotation, as specified above, will be taken per year from one acre. Wherever a farmer deviates from the practice previously stated, potassa and phosphoric acid must be largely supplied in form of special manures, as superphosphate of lime, or flour of bones and wood-ash, or crude sulphate of potassa. One hundred acres of good meadow-land in twelve hundred acres under cultivation for beet-sugar manufacture are considered in Germany a suitable proportion to raise the amount of hay required.

Stock feeding then becomes a prominent feature in the farm industry. The farm produce is largely sold in the form of live weight, and the manure is more cheaply produced by fattening live stock than it can be bought. The farmer keeps only as many horses as are indispensable, and does his farmwork, as far as possible, with oxen. He looks upon cows, if not favorably located for the milk-market, as a mere manure-machine, and keeps only as many as required to make up the stock wanting. Sheep-fattening, if he has suitable pasture, he considers a profitable business. In feeding his stock he believes in the efficiency of feeding high, to reduce the expenses of keeping; and this produces also the cheapest manure. Every animal requires a certain amount of food for daily support independent of its increase in weight; the shorter the time for fattening the more food for mere keeping is saved. In calculating the quantity of food required for the various kinds of stock, the following figures are frequently adopted: for every one hundred pounds of live weight, 3.33 pounds of hay or its equivalent per day are considered necessary as the mere support of farm stock in cases of ordinary employment, and five pounds of hay or its equivalent for every hundred pounds of live weight for fattening purposes. In the case of young stock, eight times as much food is given for production of weight as for mere sustenance; from every hundred pounds of food for support, and fifty pounds of food for growth, from four to six pounds of increase in live weight are expected as return.

Summing up the value of the various products of one acre of sugar-beets, we find at a very low calculation the following result:—

Sugar, 1,500 pounds at seven cents, . . .	$105 00
Molasses, ...	2 90
Press-cakes, ...	13 60
Preserved leaf-mass, ...	6 30
Manure (about two tons), ...	3 50

(Profit, in converted produce, &c., &c.)

Every cent of increase in the price of the sugar would be equal to fifteen dollars additional profit per acre, and every one-half per cent increase in crystallized sugar from every hundred pounds of beet roots worked, would add about 115 pounds of sugar to yield, or $8.05 additional profit per acre. These additions in profit are by no means beyond reach, for the best management in Europe realizes them.

To enter, in concluding this Report, upon a detailed calculation of what our expenses for the production of the above articles per acre would be, could be at best but a mere approximation.

It may suffice to keep in mind that in Europe from forty-six to fifty dollars per acre has to be paid in taxes to the government; that our lands are cheaper, and that machinery is taking daily more and more the place of the hand in planting seeds, in cleaning the fields, and in securing the juice from the beet roots. Where the final pecuniary results may differ so widely, as must be quite apparent from previous statements, in consequence of a more or less favorable location of the factory and the skill engaged in its management, it is unsafe to state a definite sum of profit. It must here, as in every similar instance of an industrial enterprise, suffice to know that money can be made if the business be intelligently managed. As far as the farmer is concerned there is little risk. While the profits of the beet-sugar manufacturer may be lessened by changes in provisions of political economy, the farmer is not necessarily subjected to influences of that kind. In this case, he is aware that root crops are profitable, and that aside from this, his farm lands will receive a treatment which has everywhere been proved to enrich, rather than to exhaust the soil.

To restore his land to something like its original productiveness, and to do this mainly through capital furnished by outside parties, is worthy his serious consideration.

The real importance of this subject to the farming interest of the Commonwealth, as well as to the people at large, can never be satisfactorily determined, except by a series of wisely conducted experiments, which can no where be so appropriately undertaken as at the Massachusetts Agricultural College.

APPENDIX.

Results of the Examination of Sugar-beets raised on the College Farm during the past season.

NAME.	Source of Seed.	Weight, in pounds.	Percentage of Sugar in juice.
I.—Vilmorin beet, . . .	Saxony, .	$\frac{3}{4}$ to $\frac{7}{8}$	15.50
II.—Vilmorin beet, . . .	" .	$\frac{3}{4}$ to 1	15.61
I.—White Imperial, . .	" .	$\frac{3}{4}$ to $1\frac{3}{4}$	14 20
New Imperial, . . .	" .	$1\frac{1}{4}$ to $1\frac{3}{4}$	13.80
I.—White Magdeburg, . .	" .	$1\frac{1}{2}$ to 2	13.10
Quedlinburg, . . .	" .	$1\frac{1}{2}$ to $1\frac{3}{4}$	13 44
II.—White Imperial, . .	" .	$1\frac{3}{4}$ to 2	10.27
II.—White Magdeburg, . .	Silesia, .	$1\frac{1}{2}$ to $1\frac{3}{4}$	10.06
White Silesian, . . .	" .	$1\frac{1}{4}$ to $1\frac{1}{2}$	9 72
III.—Vilmorin beet, . . .	" .	$1\frac{1}{4}$ to 1	9.93
Long White beet, . .	" .	$1\frac{1}{4}$ to $1\frac{3}{4}$	8 60
White Sugar beet, . .	" .	$1\frac{3}{4}$ to 2	7.20
Vienna Red beet, . .	" .	$1\frac{3}{4}$ to 2	8.10

The percentage of sugar was ascertained by means of a polarization apparatus, and the results obtained, in several instances, verified by Trommer's test. My thanks are due to Mr. J. E. Heyl, of Philadelphia, for kind assistance rendered in the laboratory work during his stay as special student in chemistry at the Agricultural College.

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